	From the INTERNATIONAL BUREAU			
PCT	To:			
NOTIFICATION OF THE RECORDING OF A CHANGE  (PCT Rule 92bis.1 and Administrative Instructions, Section 422)  Date of mailing (day/month/year) 20 December 2001 (20.12.01)	RINUY, SANTARELLI 14, avenue de la Grande Armée Boîte postale 237 F-75822 Paris Cedex 17 FRANCE			
Applicant's or agent's file reference BIF022366/FL		IMPORTANT NOT	IFICATION	
International application No. PCT/IB00/01908		nal filing date (day/month/) December 2000 (18.12.		
The following indications appeared on record concerning:      The applicant the inventor	the ager		on representative	
Name and Address  MILLIPORE S.A. 39, route Industrielle de la Hardt F-67120 Molsheim France		State of Nationality FR Telephone No.	State of Residence FR	
Tance		Facsimile No.		
		Teleprinter No.		
2. The International Bureau hereby notifies the applicant that t  X the person the name the add	г	change has been recorded the nationality	concerning: the residence	
Name and Address MILLIPORE 39, route Industrielle de la Hardt F-67120 Molsheim France		State of Nationality FR Telephone No.	State of Residence FR	
Fidilice		Facsimile No.		
		Teleprinter No.		
3. Further observations, if necessary:				
4. A copy of this notification has been sent to:				
X the receiving Office	[	the designated Offices	concerned	
the International Searching Authority	[	X the elected Offices cor	ncerned	
the International Preliminary Examining Authority		other:		
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized	officer R. Chrem		
Facsimile No.: (41-22) 740.14.35	Telephone	No.: (41-22) 338.83.38		

## F. JENT COOPERATION TREA. /

#### From the INTERNATIONAL BUREAU

#### **PCT**

#### **NOTIFICATION OF ELECTION**

(PCT Rule 61.2)

To:	

Commissioner **US Department of Commerce** United States Patent and Trademark Office, PCT 2011 South Clark Place Room CP2/5C24 Arlington, VA 22202

**ETATS-UNIS D'AMERIQUE** in its capacity as elected Office

ETATS-UNIS D'AMERIQU in its capacity as e
Applicant's or agent's file reference

PCT/IB00/01908 International filing date (day/month/year)

18 December 2000 (18.12.00)

Priority date (day/month/year) 24 December 1999 (24.12.99)

BIF022366/FL

**Applicant** 

LEMONNIER, Jean

1.	The designated Office is hereby notified of its election made:
	X in the demand filed with the International Preliminary Examining Authority on:
	12 May 2001 (12.05.01)
	in a notice effecting later election filed with the International Bureau on:
2.	The election X was
	was not
	made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland

**Authorized officer** 

Olivia TEFY

Telephone No.: (41-22) 338.83.38

Facsimile No.: (41-22) 740.14.35



# **PCT**

### **INTERNATIONAL SEARCH REPORT**

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	FOR FURTHER see Notification o	Transmittal of International Search Report			
BIF022366/FL ACTION (Form PCT/ISA/220) as well as, where applicable, item 5 below.					
International application No.	International filing date (day/month/year)	(Earliest) Priority Date (day/month/year)			
PCT/IB 00/01908	18/12/2000	24/12/1999			
Applicant					
MILLIPORE S.A. et al.					
This International Search Report has been according to Article 18. A copy is being tra	n prepared by this International Searching Authansmitted to the International Bureau.	nority and is transmitted to the applicant			
This International Search Report consists  X It is also accompanied by	of a total of3 sheets. a copy of each prior art document cited in this	report.			
Basis of the report					
	international search was carried out on the bas ess otherwise indicated under this item.	sis of the international application in the			
the international search w Authority (Rule 23.1(b)).	ras carried out on the basis of a translation of the	he international application furnished to this			
		ternational application, the international search			
· =	onal application in written form.				
	ernational application in computer readable form	n.			
	this Authority in written form.				
	this Authority in computer readble form.				
	osequently furnished written sequence listing d is filed has been furnished.	oes not go beyond the disclosure in the			
the statement that the info furnished	ormation recorded in computer readable form is	s identical to the written sequence listing has been			
2. Certain claims were fou	nd unsearchable (See Box I).				
3. Unity of invention is lac	king (see Box II).				
4. With regard to the title,					
the text is approved as su	ubmitted by the applicant.				
the text has been established by this Authority to read as follows:					
5. With regard to the abstract,					
the text is approved as su		ity as it appears in Roy III. The applicant may			
the text has been establis within one month from the	shed, according to Rule 38.2(b), by this Authori e date of mailing of this international search rep	oort, submit comments to this Authority.			
6. The figure of the <b>drawing</b> s to be pub	6. The figure of the <b>drawings</b> to be published with the abstract is Figure No.				
as suggested by the appl	X as suggested by the applicant. None of the figures.				
because the applicant fai	because the applicant failed to suggest a figure.				
because this figure better characterizes the invention.					

PCT/IB 00/01908 CLASSIFICATION OF SUBJECT MATTER 2C 7 C12M1/12 IPC 7 According to International Patent Classification (IPC) or to both national classification and IPC **B. FIELDS SEARCHED** Minimum documentation searched (classification system followed by classification symbols) IPC 7 C12M B01D B01L Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal, WPI Data, PAJ C. DOCUMENTS CONSIDERED TO BE RELEVANT Category ' Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No. X US 4 319 996 A (VINCENT MONTY E ET AL) 1,2,4,11 16 March 1982 (1982-03-16) claims; figures EP 0 319 701 A (HEILMEIER & WEINLEIN) 1,2,4,11 14 June 1989 (1989-06-14) claims; figures 5 EP 0 059 809 A (SYBRON CORP) Y 15 September 1982 (1982-09-15) figures 1,2 Υ US 4 678 576 A (LEONCAVALLO RICHARD A) 5 7 July 1987 (1987-07-07) figure 1 Further documents are listed in the continuation of box C. Patent family members are listed in annex. Special categories of cited documents: "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention citation or other special reason (as specified) cannot be considered to involve an inventive step when the document is combined with one or more other such docudocument referring to an oral disclosure, use, exhibition or ments, such combination being obvious to a person skilled other means document published prior to the international filing date but "&" document member of the same patent family later than the priority date claimed Date of mailing of the international search report Date of the actual completion of the international search

23/02/2001

Coucke, A

Authorized officer

1

Name and mailing address of the ISA

19 February 2001

European Patent Office, P.B. 5818 Patentlaan 2

### ITERNATIONAL SEARCH REPORT

mation on patent family members

emational Application No
PCT/IB 00/01908

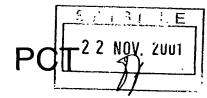
	atent document I in search report		Publication date	1	Patent family member(s)	Publication date
US	4319996	Α	16-03-1982	CA	1171365 A	24-07-1984
				FR	2493720 A	14-05-1982
			:	GB	2086752 A,B	19-05-1982
				JP	1256843 C	29-03-1985
				JP	57091711 A	08-06-1982
				JP	59033403 B	15-08-1984
EP	0319701	Α	14-06-1989	DE	3741388 C	30-03-1989
				JP	2002809 A	08-01-1990
EP	0059809	Α	15-09-1982	AU	541787 B	17-01-1985
				AU	7613881 A	09-09-1982
				CA	1176575 A	23-10-1984
				DE	3169275 D	18-04-1985
				JP	1326266 C	16-07-1986
				JP	57144013 A	06-09-1982
				JP	60049005 B	30-10-1985
				US	4614585 A	30-09-1986
US	4678576	Α	07-07-1987	AU	553526 B	17-07-1986
				AU	8794682 A	24-03-1983
				CA	1198063 A	17-12-1985
				DE	3268134 D	06-02-1986
				ΕP	0075405 A	30-03-1983
				JP	1008295 B	13-02-1989
				JP	1526071 C	30-10-1989
				JP	58061439 A	12-04-1983

FL

From the INTERNATIONAL PRELIMINAR	RY EXAMINING AUTHORITY
То:	Arrive to
RINITY SANTARELLI	, , , , , , , , , , , , , , , , , , , ,

RINUY, SANTARELLI
14, avenue de la Grande Armée
Boîte postale 237
F-75822 Paris Cedex 17

22.NOV.2001 RINUY SANTARELLI



NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing (day/month/year)

20.11.2001

Applicant's or agent's file reference BIF022366/WO

International application No.

FRANCE

International filing date (day/month/year) 18/12/2000

Priority date (day/month/year) 24/12/1999

IMPORTANT NOTIFICATION

Applicant

PCT/IB00/01908

MILLIPORE S.A. et al.

- 1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
- 2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
- 3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

#### 4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/

Authorized officer

Longo, E

European Patent Office D-80298 Munich

Tel. +49 89 2399 - 0 Tx: 523656 epmu d

Fax: +49 89 2399 - 4465

Tel.+49 89 2399-8141



#### **PATENT COOPERATION TREATY**

KL

From the INTERNATIONAL SEARCHING AUTHORITY	PCT			
RINUY, SANTARELLI 14, avenue de la Grande Armée Boîte postale 237 F-75822 Paris Cedex 17 FRANCE  23.FEV.2001 RINUY SANTARELLI	NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT OR THE DECLARATION  SAISI LE  23 FEV. 2001  Date of mailing			
	(day/month/year) 23/02/2001			
Applicant's or agent's file reference BIF022366/FL	FOR FURTHER ACTION See paragraphs 1 and 4 below			
International application No.	, , , , , , , , , , , , , , , , , , , ,			
PCT/ IB 00/01908	International filing date (day/month/year) 18/12/2000			
Applicant /	18/12/2000			
MILLIPORE S.A. et al.				
1. X The applicant is hereby notified that the International Search Report has been established and is transmitted herewith.  Filing of amendments and statement under Article 19:  The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):  When? The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.  Where? Directly to the International Bureau of WIPO 34, chemin des Colombettés 1211 Geneva 20, Switzerland Fascimile No.: (41–22) 740.14.35  For more detailed instructions, see the notes on the accompanying sheet.  2. The applicant is hereby notified that no International Search Report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.				
3. With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:  the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.  no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.				
Further action(s): The applicant is reminded of the following:				
Shortly after 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.  Within 19 months from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).  Within 20 months from the priority date, the applicant must perform the prescribed acts for entry into the national phase				
before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.  Name and mailing address of the International Searching Authority  Authorized officer				

Andria Overbeeke-Siepkes

European Patent Office, P.B. 5818 Patentlaan 2

NL-2280 HV Rijswijk

Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

#### **NOTES TO FORM PCT/ISA/220**

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions respectively.

#### INSTRUCTIONS CONCERNING: AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only.

#### What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

#### When?

Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

#### Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been fis filed, see below.

#### How?

DEICONOLD. VOID + MARIOTHIO -

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

#### What documents must/may accompany the amendments?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application i English, the letter must be in English; if the language of the international application is French, the letter must be in French.



The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

## The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

- [Where originally there were 48 claims and after amendment of some claims there are 51]:
   "Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
- [Where originally there were 15 claims and after amendment of all claims there are 11]: "Claims 1 to 15 replaced by amended claims 1 to 11."
- [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:
  - "Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or "Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
- 4. [Where various kinds of amendments are made]: "Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

#### "Statement under article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

It must be in the language in which the international appplication is to be published.

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

#### Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the same time of filing the amendments with the International Bureau, also file a copy of such amendments with the International Preliminary Examining Authority (see Rule 62.2(a), first sentence).

#### Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, where upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Cuide

Notes to Form PCT/ISA/220 (second sheet) (January 1994)

Name and mailing address of the international preliminary examining authority:

European Patent Office

D-80298 Munich

Tel. +49 89 2399 - 0 Tx: 523656 epmu d

Fax: +49 89 2399 - 4465

Lindner, A

Formalities officer (incl. extension of time limits)

Longo, E

Telephone No. +49 89 2399 8141



i. Basi	s of	the c	pin	ion
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•••		ioio oi tiio opiiiioii			
1.	With regard to the <b>elements</b> of the international application (Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed")				
	Description, pages:				
	1-1	12	as originally filed		
	Cla	aims, No.:			
	1-1	3	as originally filed		
	Dra	awings, sheets:			
	1/7	-7/7	as originally filed		
2.	Wit lang	h regard to the <b>lang</b> guage in which the i	uage, all the elements marked above were available or fumished to this Authority in the nternational application was filed, unless otherwise indicated under this item.		
	The	ese elements were a	vailable or furnished to this Authority in the following language: , which is:		
		the language of a t	ranslation furnished for the purposes of the international search (under Rule 23.1(b)).		
		the language of pu	blication of the international application (under Rule 48.3(b)).		
		the language of a t 55.2 and/or 55.3).	ranslation furnished for the purposes of international preliminary examination (under Rule		
3.	Witl inte	h regard to any <b>nuc</b> rnational preliminary	leotide and/or amino acid sequence disclosed in the international application, the y examination was carried out on the basis of the sequence listing:		
		contained in the int	ernational application in written form.		
		filed together with t	he international application in computer readable form.		
		furnished subseque	ently to this Authority in written form.		
		furnished subseque	ently to this Authority in computer readable form.		
			the subsequently furnished written sequence listing does not go beyond the disclosure in plication as filed has been furnished.		
		The statement that listing has been fur	the information recorded in computer readable form is identical to the written sequence nished.		
4.	The	amendments have	resulted in the cancellation of:		
		the description,	pages:		

Nos.:

☐ the claims,

	the drawings,	sheets:	
5.	This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):		
	(Any replacement sh report.)	eet containing such amendments must be referred to under item 1 and annexed to this	

- 6. Additional observations, if necessary:
- V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- 1. Statement

Novelty (N)

Claims 1-12

Inventive step (IS)

Claims 13

Industrial applicability (IA)

Claims

2. Citations and explanations see separate sheet

#### VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made: see separate sheet

#### Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

- 1. Reference is made to the following documents:
  - D1: US-A-4 319 996 (VINCENT MONTY E ET AL) 16 March 1982 (1982-03-16)
  - D2: EP-A-0 319 701 (HEILMEIER & WEINLEIN) 14 June 1989 (1989-06-14)
- 2. D1 discloses a device comprising an intake body, a filtering membrane and a drainage body having means of supporting said membrane on the opposite side of the intake body wherein said support means have a concave surface facing said membrane (D1: claim 1). As a consequence, D1 destroys the novelty of independent claim 1 (Article 33(2) PCT).
- a device as claimed in present claim 1 is also referred to in D2 (D2: claims; figures 3. 1 and 2). Therefore, D2 is also detrimental for the novelty of present claim 1 (Article 33(2) PCT).
- D1 also provides for using vacuum in order to operate the filter system (D1: § 4. bridging col. 3 and 4) without specifically indicating that the output pipe in engaged in the central hole of the stopper of the vacuum flask. Such an arrangement is, however, quite common in laboratories and, as a consequence, devoid of any inventive step. The subject-matter of present claim 13 therefore does not meet the requirements of Article 33(3) PCT.
- With regard to dependent claims 2-12, it is noted that a positive opinion can only 5. be given, if they refer to independent claims that meet the requirements of the PCT.

#### Re Item VIII

#### Certain observations on the international application

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art 6. disclosed in the documents D1 and D2 is not mentioned in the description, nor are these documents identified therein.

- 7. The description should be adapted to the new claims to be filed (Rule 5.1(a)(iii) PCT).
- The applicant is invited to specifically indicate which amendments have been 8. made to the pages of the sequence listing and where a basis may be found for these amendments in the application as originally filed (Rule 66.8(a) PCT). Failure to comply with this invitation will result in the sequence listing not being examined.

## PATENT COOPERATION TOTAL

# **PCT**

REC'D	2 2	NOV	2001
WIPO		F	CT

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference BIF022366/WO	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)			
		Tommany Examination (1900)			
International application No. PCT/IB00/01908	International filing date (day/mor. 18/12/2000	nth/year) Priority date (day/month/year) 24/12/1999			
International Patent Classification (IPC) or na		24/12/1999			
C12M1/12	auonai ciassilicauon ano ir c				
Applicant					
MILLIPORE S.A. et al.					
This international preliminary exam	ination report has been proper	ad by this laternational Dufficient Equation 1			
and is transmitted to the applicant	according to Article 36.	ed by this International Preliminary Examining Authority			
2. This REPORT consists of a total of	4 sheets, including this cover	sheet.			
☐ This report is also accompanie	d by ANNEXES, i.e. sheets of t	the description, claims and/or drawings which have			
been amended and are the bas	sis for this report and/or sheets	containing rectifications made before this Authority			
(see Rule 70.16 and Section 6	07 of the Administrative Instruct	tions under the PCT).			
These annexes consist of a total of	5 sheets.				
3. This report contains indications rela	iting to the following items:				
I ⊠ Basis of the report					
I ⊠ Basis of the report II □ Priority					
_ ′	pinion with regard to novelty, in	oventive step and industrial applicability			
IV   Lack of unity of invention	n				
V ⊠ Reasoned statement ur citations and explanation	nder Article 35(2) with regard to ons suporting such statement	novelty, inventive step or industrial applicability;			
VI Certain documents cite					
VII   Certain defects in the in	ternational application				
VIII   Certain observations or	the international application				
Date of submission of the demand	Date of	completion of this report			
12/05/2001	20.11.2	2001			
1200,2001	20.11.2				
Name and mailing address of the international preliminary examining authority:	Authoriz	zed officer			
European Patent Office					
D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656	epmu d Lindne	er, A			
Fax: +49 89 2399 - 4465		one No. +49 89 2399 8640			

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IB00/01908

I.	Basis	f	the	r	р	rt
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1.	. With regard to the <b>lements</b> of the international application (Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)): <b>Description, pages:</b>							
	3-1	2	as originally filed					
	1,2	,2a	as received on	02/11/2001	with letter of	30/10/2001		
	Cla	ims, No.:						
	1-1	2	as received on	02/11/2001	with letter of	30/10/2001		
Drawings, sheets:								
	1/7	-7/7	as originally filed					
2.	2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item. These elements were available or furnished to this Authority in the following language: , which is:							
the language of a translation furnished for the purposes of the international search (under Rule 23.1) the language of publication of the international application (under Rule 48.3(b)).				nder Rule 23.1(b)).				
				er Rule 48.3(b)).				
the language of a translation furnished for the purposes of international preliminary 55.2 and/or 55.3).			national preliminary ex	amination (under Rule				
3.	B. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:				application, the			
<ul> <li>contained in the international application in written form.</li> <li>filed together with the international application in computer readable form.</li> <li>furnished subsequently to this Authority in written form.</li> </ul>								
	☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.							
		The statement that listing has been fur	the information recorded in connished.	nputer readab	le form is identical to t	he written sequence		
4.	The	amendments have	resulted in the cancellation of:					

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IB00/01908

		the description, the claims, the drawings,	pages: Nos.: sheets:		
5.	5. This report has been established as if (some of) the amendments had not been made, since they have considered to go beyond the disclosure as filed (Rule 70.2(c)):				
		(Any replacement shoreport.)	eet contai	ning such	n amendments must be referred to under item 1 and annexed to this
6.	Add	itional observations, if	necessar	y:	
V.		soned statement und tions and explanation			rith regard to novelty, inventive step or industrial applicability;
1.	State	ement			
	Nov	elty (N)	Yes: No:	Claims Claims	1-12
	Inve	ntive step (IS)	Yes: No:	Claims Claims	1-12
	Indu	strial applicability (IA)	Yes: No:	Claims Claims	1-12

2. Citations and explanations see separate sheet

## **EXAMINATION REPORT - SEPARATE SHEET**

#### R Item V

R ason d stat ment under Articl 35(2) with regard to n\_velty, inventive step or industrial applicability; citations and explanations supporting such statement

- 1. Reference is made to the following documents:
  - D1: US-A-4 319 996 (VINCENT MONTY E ET AL) 16 March 1982 (1982-03-16)
  - D2: EP-A-0 319 701 (HEILMEIER & WEINLEIN) 14 June 1989 (1989-06-14)
- D1 discloses a device comprising an intake body, a filtering membrane and a 2. drainage body having means of supporting said membrane on the opposite side of the intake body wherein said support means have a concave surface facing said membrane (D1: claim 1). D1 does not disclose the ratio of the difference between the length of the arc and length of the chord of the arc as claimed in present claim 1. As a consequence, D1 does not anticipate the subject-matter of the present set of claims (Article 33(2) PCT).
- Likewise, the device as disclosed in D2 is not defined by the ratio of the difference 3. between the length of the arc and length of the chord of the arc, either (D2: claims; figures 1 and 2). Therefore, D2 is not detrimental for the novelty of presently claimed subject-matter, either (Article 33(2) PCT).
- It is the object of the present invention to avoid creases which form on the 4. membrane on account of the expansion which the membrane undergoes when it changes from the dry state to the wet state. This problem was solved by a concave support means having a ratio of the difference between the length of the arc and length of the chord of the arc corresponding to the coefficient of expansion of the membrane between the dry and the wet state. This solution is not evident in the light of D1 (closest state of the art) because there the concave membrane support has the function of concentrating gases which otherwise might clog the membrane. There is, starting from D1, no incentive for the person skilled in the art to select the ratio of the difference between the length of the arc and length of the chord of the arc such that it corresponds to the coefficient of expansion of the membrane between dry and wet state in order to avoid the formation of creases. The requirements of Article 33(3) PCT are therefore met.

# "Device for microbiological examination of a sample of liquid and method for draining this device"

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The invention relates to the devices for microbiological examination of a sample of liquid.

Such devices are already known, which have an intake body, a filtering membrane and a drainage body designed to support the membrane on the opposite side from the intake body.

In general, these devices work by simple gravity and have the general form of a funnel into which the sample to be examined is introduced through the upper opening while the liquid which has passed through the membrane is recovered by means of the output pipe. There also exists such a device provided for the sampling of a liquid under pressure, described in French patent 2 677 664.

The invention aims to make it possible to culture micro-organisms collected by filtration on the membrane under the best possible conditions.

To that end it proposes a device for microbiological examination of a sample of liquid, having an intake body, a filtering membrane and a drainage body having means of supporting said membrane on the opposite side from said intake body; characterised in that said support means have a concave surface facing said membrane, and in that the ratio of the difference between the length of the arc corresponding to the profile, in a diametral plane, of said surface of said support means and between the length of the chord of this arc, over the latter length, corresponds to the coefficient of expansion of said membrane between the dry state and the wet state.

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By virtue of the concave nature of this surface, it is possible to avoid the creases which form on the membrane of the earlier devices, where the corresponding surface is flat, on account of the expansion which the membrane undergoes when it changes from the dry state to the wet state.

Moreover, once the sampling has been performed, the membrane has a concave form on the intake side, that is to say on the side where any retained micro-organisms are present, the curvature of the membrane thus being in the correct direction where putting it down on the surface of the culture medium in the Petri dish is concerned, minimizing the risks of trapping one or more pocket(s) of air between the culture medium and the membrane, which are particularly dangerous since they can lead to false results, and in particular to the conclusion that the sample meets health standards whereas in reality the absence or the small quantity of micro-organisms on the membrane after incubation results from the fact that the membrane was isolated from the culture medium by the pocket or pockets of air.

The difference ratio makes it possible to achieve the best cooperation between the membrane and the support means.

It should be noted that filtration units comprising an intake body, a filtering membrane and a drainage body having means of supporting the membrane on the opposite side from the intake body having a concave surface facing the membrane was already known outside the field of devices for microbiological examination of a sample of liquid, in particular from US 4 319 116 A and from EP 0 319 701 A. These filtration units can not be used for microbiological examination of a sample of liquid, because they are not designed for being opened after filtering the liquid so as to recover the membrane. The reason for which a concave surface is provided in these filtration units is exclusively the maintenance of the filtration capacities, by prevention of blocking respectively because of an air bubble or because of clogging. In the devices disclosed by these documents, it is merely stated that the filter is deformable and that the required deformation for taking the concave shape of the bearing surface is less than the deformation that would damage

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the filter (there is no question of the expansion coefficient of a membrane between the dry state and the wet state).

According to preferred characteristics, for reasons of simplicity and convenience, both in manufacture and in use, said support means are formed by a porous pad.

According to other preferred characteristics, said drainage body has an output aperture in the continuation of the internal passage of a coaxially disposed output pipe with preferably the drainage body having, around said output pipe, an annular rib tapering towards its end.

It is then possible to drain the device as described above by placing it on a vacuum flask with said output pipe engaged in the central hole of the stopper of said flask and said annular rib resting on this stopper.

The invention also relates, in a second aspect, to this drainage method.

It should be noted that it is also possible to use this method and provide the arrangement described above of the output pipe and the annular rib

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#### **CLAIMS**

- 1. Device for microbiological examination of a sample of liquid, having an intake body, a filtering membrane and a drainage body having means of supporting said membrane on the opposite side from said intake body; characterised in that said support means (48) have a concave surface facing said membrane (4), and in that the ratio of the difference between the length of the arc corresponding to the profile, in a diametral plane, of said surface of said support means (48) and between the length of the chord of this arc, over the latter length, corresponds to the coefficient of expansion of said membrane (4) between the dry state and the wet state.
- 2. Device according to Claim 1, characterised in that said support means are formed by a porous pad (48).
- 3. Device according to Claim 2, characterised in that said drainage body (3) has drainage channels (39) under said porous pad (48), said drainage channels opening into an output aperture (38).
- 4. Device according to any one of Claims 1 to 3, characterised in that said drainage body (3) has a circular table (30) provided at its centre with said means of supporting (48) said membrane (4) and having, around said support means (48), a wall (32) having a surface (33) situated facing said elastomer seal (13), which forms part of said intake body (2), said membrane (4) being squeezed between said surface (33) and said seal (13).
- 5. Device according to Claim 4, characterised in that the external diameter of said circular table (30) corresponds substantially to the internal diameter of a skirt (6) included in said intake body (2), said skirt (6) encircling said circular table (30).
- 6. Device according to Claim 5, characterised in that areas of extra thickness for wedging (27) are provided between said circular table (30) and said skirt (6).
- 7. Device according to any one of Claims 4 to 6, characterised in that said drainage body has a skirt (31) disposed in a step with respect to said circular table (30).

- 8. Device according to Claim 7, characterised in that said skirt (31) has means of latching (42, 44, 45) with said intake body (2).
- 9. Device according to either one of Claims 7 or 8, characterised in that said skirt (31) of the drainage body (3) has at least one notch (47) adapted to allow the placing of a drainage syringe (64).
- 10. Device according to any one of Claims 1 to 9, characterised in that said drainage body (3) has an output aperture (38) in the continuation of the internal passage of a coaxially disposed output pipe (37).
- 11. Device according to Claim 10, characterised in that said drainage body (3) has, around said output pipe (37), an annular rib (40) tapering towards its end.
  - 12. Method for draining a device according to Claim 11, characterised in that it is placed on a vacuum flask (71) with said output pipe (37) engaged in the central hole (75) of the stopper (74) of said flask and said annular rib (40) resting on this stopper.

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# **TITLE of the INVENTION**

Device for microbiological examination of a sample of liquid and method for draining this device

# **TEXT of the ABSTRACT**

This concerns a device for microbiological examination of a sample of liquid, having an intake body (2), a filtering membrane (4) and a drainage body (3) having means of supporting (48) said membrane on the opposite side from said intake body, these support means (48) having a concave surface facing said membrane (4).

The drainage method proposes directly placing the device on a vacuum flask, the sealing of the stopper of said flask being obtained by a rib (40) tapering towards its end.

(Figure 2)

10/08335

# "Device for microbiological examination of a sample of liquid and method for draining this device"

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The invention relates to the devices for microbiological examination of a sample of liquid.

Such devices are already known, which have an intake body, a filtering membrane and a drainage body designed to support the membrane on the opposite side from the intake body.

In general, these devices work by simple gravity and have the general form of a funnel into which the sample to be examined is introduced through the upper opening while the liquid which has passed through the membrane is recovered by means of the output pipe. There also exists such a device provided for the sampling of a liquid under pressure, described in French patent 2 677 664.

The invention aims to make it possible to culture micro-organisms collected by filtration on the membrane under the best possible conditions.

To that end it proposes a device for microbiological examination of a sample of liquid, having an intake body, a filtering membrane and a drainage body having means of supporting said membrane on the opposite side from said intake body; characterised in that said support means have a concave surface facing said membrane, and in that the ratio of the difference between the length of the arc corresponding to the profile, in a diametral plane, of said surface of said support means and between the length of the chord of this arc, over the latter length, corresponds to the coefficient of expansion of said membrane between the dry state and the wet state.

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By virtue of the concave nature of this surface, it is possible to avoid the creases which form on the membrane of the earlier devices, where the corresponding surface is flat, on account of the expansion which the membrane undergoes when it changes from the dry state to the wet state.

Moreover, once the sampling has been performed, the membrane has a concave form on the intake side, that is to say on the side where any retained micro-organisms are present, the curvature of the membrane thus being in the correct direction where putting it down on the surface of the culture medium in the Petri dish is concerned, minimizing the risks of trapping one or more pocket(s) of air between the culture medium and the membrane, which are particularly dangerous since they can lead to false results, and in particular to the conclusion that the sample meets health standards whereas in reality the absence or the small quantity of micro-organisms on the membrane after incubation results from the fact that the membrane was isolated from the culture medium by the pocket or pockets of air.

The difference ratio makes it possible to achieve the best cooperation between the membrane and the support means.

It should be noted that filtration units comprising an intake body, a filtering membrane and a drainage body having means of supporting the membrane on the opposite side from the intake body having a concave surface facing the membrane was already known outside the field of devices for microbiological examination of a sample of liquid, in particular from US 4 319 116 A and from EP 0 319 701 A. These filtration units can not be used for microbiological examination of a sample of liquid, because they are not designed for being opened after filtering the liquid so as to recover the membrane. The reason for which a concave surface is provided in these filtration units is exclusively the maintenance of the filtration capacities, by prevention of blocking respectively because of an air bubble or because of clogging. In the devices disclosed by these documents, it is merely stated that the filter is deformable and that the required deformation for taking the concave shape of the bearing surface is less than the deformation that would damage

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the filter (there is no question of the expansion coefficient of a membrane between the dry state and the wet state).

According to preferred characteristics, for reasons of simplicity and convenience, both in manufacture and in use, said support means are formed by a porous pad.

According to other preferred characteristics, said drainage body has an output aperture in the continuation of the internal passage of a coaxially disposed output pipe with preferably the drainage body having, around said output pipe, an annular rib tapering towards its end.

It is then possible to drain the device as described above by placing it on a vacuum flask with said output pipe engaged in the central hole of the stopper of said flask and said annular rib resting on this stopper.

The invention also relates, in a second aspect, to this drainage method.

It should be noted that it is also possible to use this method and provide the arrangement described above of the output pipe and the annular rib

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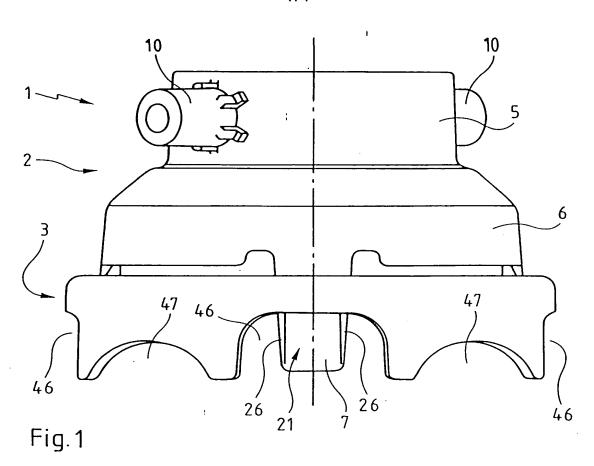
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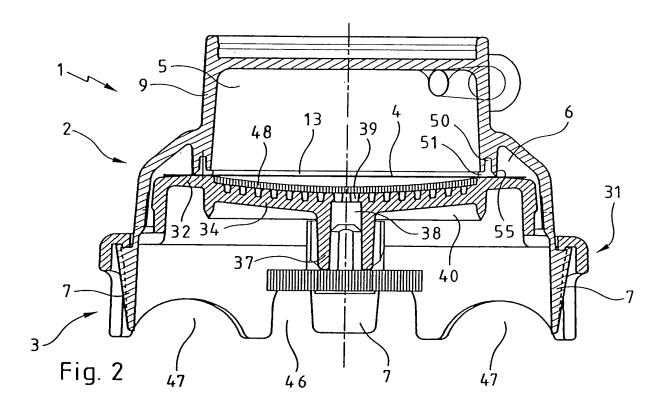
#### **CLAIMS**

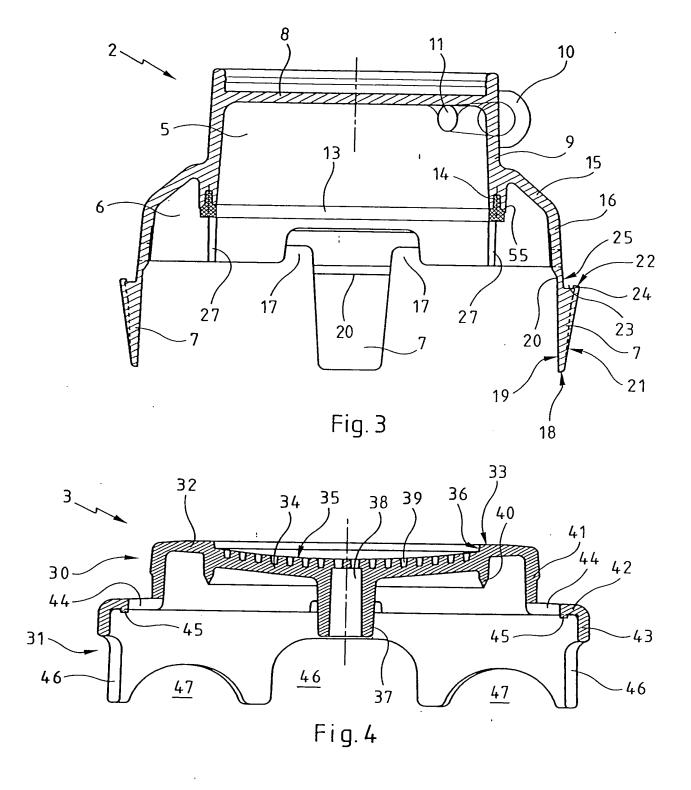
- 1. Device for microbiological examination of a sample of liquid, having an intake body, a filtering membrane and a drainage body having means of supporting said membrane on the opposite side from said intake body; characterised in that said support means (48) have a concave surface facing said membrane (4), and in that the ratio of the difference between the length of the arc corresponding to the profile, in a diametral plane, of said surface of said support means (48) and between the length of the chord of this arc, over the latter length, corresponds to the coefficient of expansion of said membrane (4) between the dry state and the wet state.
- 2. Device according to Claim 1, characterised in that said support means are formed by a porous pad (48).
- 3. Device according to Claim 2, characterised in that said drainage body (3) has drainage channels (39) under said porous pad (48), said drainage channels opening into an output aperture (38).
- 4. Device according to any one of Claims 1 to 3, characterised in that said drainage body (3) has a circular table (30) provided at its centre with said means of supporting (48) said membrane (4) and having, around said support means (48), a wall (32) having a surface (33) situated facing said elastomer seal (13), which forms part of said intake body (2), said membrane (4) being squeezed between said surface (33) and said seal (13).
- 5. Device according to Claim 4, characterised in that the external diameter of said circular table (30) corresponds substantially to the internal diameter of a skirt (6) included in said intake body (2), said skirt (6) encircling said circular table (30).
- 6. Device according to Claim 5, characterised in that areas of extra thickness for wedging (27) are provided between said circular table (30) and said skirt (6).
- Device according to any one of Claims 4 to 6, characterised in
   that said drainage body has a skirt (31) disposed in a step with respect to said circular table (30).

- 8. Device according to Claim 7, characterised in that said skirt (31) has means of latching (42, 44, 45) with said intake body (2).
- 9. Device according to either one of Claims 7 or 8, characterised in that said skirt (31) of the drainage body (3) has at least one notch (47) adapted to allow the placing of a drainage syringe (64).
- 10. Device according to any one of Claims 1 to 9, characterised in that said drainage body (3) has an output aperture (38) in the continuation of the internal passage of a coaxially disposed output pipe (37).
- 11. Device according to Claim 10, characterised in that said drainage body (3) has, around said output pipe (37), an annular rib (40) tapering towards its end.
  - 12. Method for draining a device according to Claim 11, characterised in that it is placed on a vacuum flask (71) with said output pipe (37) engaged in the central hole (75) of the stopper (74) of said flask and said annular rib (40) resting on this stopper.

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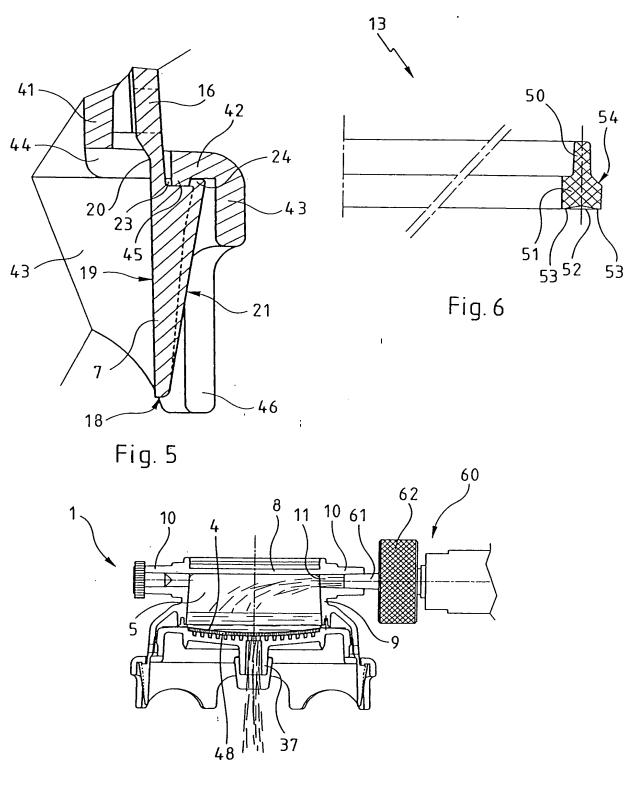


Fig. 7

Fig. 9

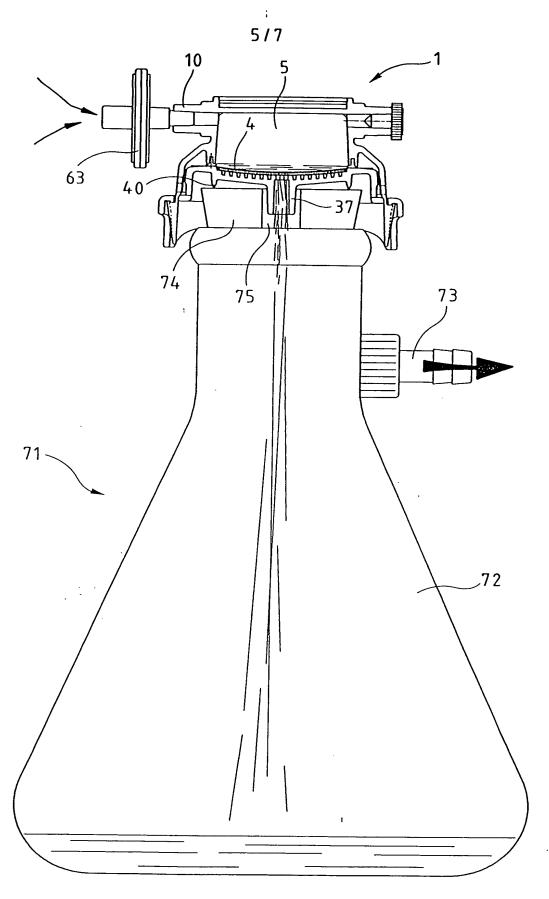
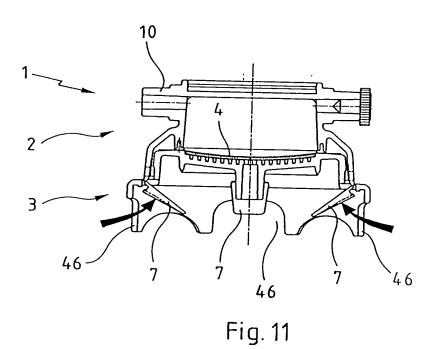
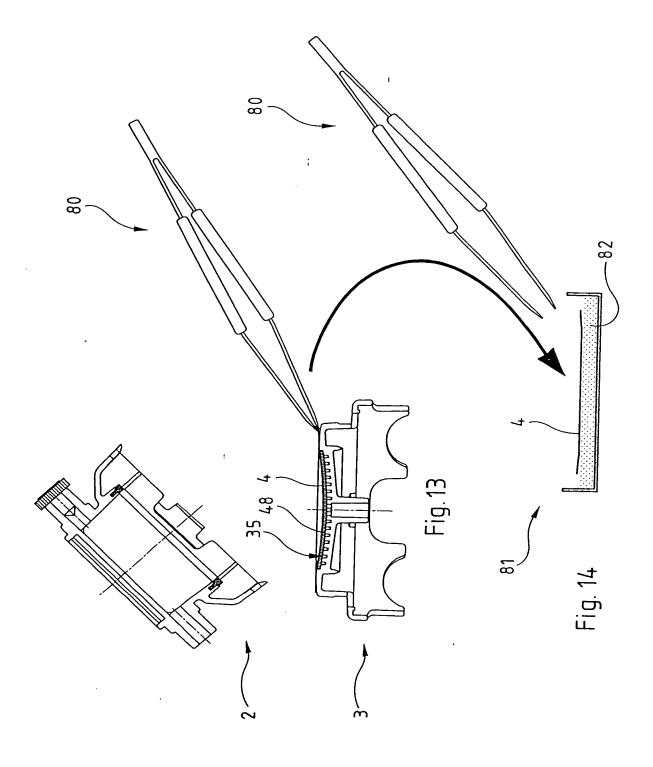


Fig. 10



2 46 46

Fig. 12



## PATENT COOPERATION TREATY

## **PCT**

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's	or ao	ent's file reference	1	·			
BIF022366/WO			FOR FURTHER A	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)			
International application No.			International filing date	mational filing date (day/month/year) Priority date		e (day/month/year)	
PCT/IB0	0/019	908	18/12/2000		24/12/1999		
Applicant MILLIPO  1. This i and is  2. This I	RES ntern s tran	ational preliminary exami smitted to the applicant a DRT consists of a total of	nation report has been coording to Article 36.  4 sheets, including this by ANNEXES, i.e. she is for this report and/or	prepared s cover sh eets of the sheets co	et. description, claims and/or drawin	ngs which have	
		exes consist of a total of		·	49-77-1		
3. This r	eport	contains indications relat	ling to the following iter	ns:			
ı	×	Basis of the report					
II		Priority				:	
111		Non-establishment of or	pinion with regard to no	velty, inve	ntive step and industrial applicabi	lity	
IV		Lack of unity of invention					
V	⊠	Reasoned statement un citations and explanation	der Article 35(2) with rens suporting such state	egard to n ement	velty, inventive step or industrial	applicability;	
VI		Certain documents cite	d .				
VII		Certain defects in the in					
VIII		Certain observations on	the international applic	cation			
Date of submission of the demand				Date of co	npletion of this report		
12/05/200	01		;	20.11.200			
Name and r	exami	address of the international ning authority:		Authorize	officer	SE MEDIES MATERIALISMA	
<b>()</b>	D-80	pean Patent Office 1298 Munich +49 89 2399 - 0 Tx: 523656	enmu d	Lindner	A	Structon Williams	
		+49 89 2399 - 4465	op.nu u	Talaabaa	N=40.00.0000.0040	10 10 10 10 10 IN	

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IB00/01908

I.	Basis	of t	the	report	ĺ

1.	the and	receiving Office in I	nents of the international applications to an invitation under to this report since they do not co	Article 14 are	referred to in this repo	ort as "originally filed"
	3-12	2	as originally filed			
	1,2,	2a	as received on	02/11/2001	with letter of	30/10/2001
	Clai	ms, No.:				
	1-12	2	as received on	02/11/2001	with letter of	30/10/2001
	Dra	wings, sheets:			•	
	1/7-	7/7	as originally filed			
				1		
2.	With lang	regard to the lang uage in which the i	juage, all the elements marked and international application was file	above were a d, unless othe	vailable or furnished to erwise indicated under	o this Authority in the this item.
	The	se elements were a	available or furnished to this Aut	hority in the fo	ollowing language: ,	which is:
		the language of a	translation furnished for the purp	ooses of the in	nternational search (ur	nder Rule 23.1(b)).
		the language of pu	ublication of the international app	olication (unde	er Rule 48.3(b)).	
		the language of a 55.2 and/or 55.3).	translation furnished for the purp	ooses of inter	national preliminary ex	camination (under Rule
3.			eleotide and/or amino acid seq y examination was carried out o			I application, the
		contained in the in	ternational application in written	form.		
		filed together with	the international application in c	omputer read	able form.	
		furnished subsequ	ently to this Authority in written	form.		
		furnished subsequ	ently to this Authority in comput	er readable fo	orm.	
		the international a	t the subsequently furnished wr pplication as filed has been furn	ished.		
		The statement tha listing has been fu	it the information recorded in col irnished.	mputer readal	ble form is identical to	the written sequence
4.	The	amendments have	e resulted in the cancellation of:			

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IB00/01908

		the description,	pages:		
		the claims,	Nos.:		ı
		the drawings,	sheets:		
5.		This report has been considered to go bey	establish ond the d	ed as if (s isclosure	some of) the amendments had not been made, since they have been as filed (Rule 70.2(c)):
		(Any replacement she report.)	eet contai	ining such	n amendments must be referred to under item 1 and annexed to this
6.	Add	itional observations, if	necessa	ry:	
V.	Rea cita	soned statement und tions and explanatio	der Articl ns suppo	e 35(2) w orting suc	rith regard to novelty, inventive step or industrial applicability;
1.	Stat	ement			•
	Nov	elty (N)	Yes: No:	Claims Claims	1-12
	Inve	ntive step (IS)	Yes: No:	Claims Claims	1-12
	Indu	strial applicability (IA)	Yes: No:	Claims Claims	1-12
2.	Citat	tions and explanations	<b>;</b>		

see separate sheet

### **EXAMINATION REPORT - SEPARATE SHEET**

#### R It m V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

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D2: EP-A-0 319 701 (HEILMEIER & WEINLEIN) 14 June 1989 (1989-06-14)

- 2. D1 discloses a device comprising an intake body, a filtering membrane and a drainage body having means of supporting said membrane on the opposite side of the intake body wherein said support means have a concave surface facing said membrane (D1: claim 1). D1 does not disclose the ratio of the difference between the length of the arc and length of the chord of the arc as claimed in present claim 1. As a consequence, D1 does not anticipate the subject-matter of the present set of claims (Article 33(2) PCT).
- Likewise, the device as disclosed in D2 is not defined by the ratio of the difference 3. between the length of the arc and length of the chord of the arc, either (D2: claims; figures 1 and 2). Therefore, D2 is not detrimental for the novelty of presently claimed subject-matter, either (Article 33(2) PCT).
- It is the object of the present invention to avoid creases which form on the 4. membrane on account of the expansion which the membrane undergoes when it changes from the dry state to the wet state. This problem was solved by a concave support means having a ratio of the difference between the length of the arc and length of the chord of the arc corresponding to the coefficient of expansion of the membrane between the dry and the wet state. This solution is not evident in the light of D1 (closest state of the art) because there the concave membrane support has the function of concentrating gases which otherwise might clog the membrane. There is, starting from D1, no incentive for the person skilled in the art to select the ratio of the difference between the length of the arc and length of the chord of the arc such that it corresponds to the coefficient of expansion of the membrane between dry and wet state in order to avoid the formation of creases. The requirements of Article 33(3) PCT are therefore met.

# INTERNATIONAL PATENT APPLICATION N° PCT/IB00/01908 Filed on December 18 2000

### **APPLICANT**

MILLIPORE S.A.

### TITLE

« Device for microbiological examination of a sample of liquid and method for draining this device. »

**Inventor** 

Jean LEMONNIER

# "Device for microbiological examination of a sample of liquid and method for draining this device"

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The invention relates to the devices for microbiological examination of a sample of liquid.

Such devices are already known, which have an intake body, a filtering membrane and a drainage body designed to support the membrane on the opposite side from the intake body.

In general, these devices work by simple gravity and have the general form of a funnel into which the sample to be examined is introduced through the upper opening while the liquid which has passed through the membrane is recovered by means of the output pipe. There also exists such a device provided for the sampling of a liquid under pressure, described in French patent 2 677 664.

The invention aims to make it possible to culture micro-organisms collected by filtration on the membrane under the best possible conditions.

To that end it proposes a device for microbiological examination of a sample of liquid, having an intake body, a filtering membrane and a drainage body having means of supporting said membrane on the opposite side from said intake body; characterised in that said support means have a concave surface facing said membrane.

By virtue of the concave nature of this surface, it is possible to avoid the creases which form on the membrane of the earlier devices, where the corresponding surface is flat, on account of the expansion which the membrane undergoes when it changes from the dry state to the wet state.

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In general, these devices work by simple gravity and have the general form of a funnel into which the sample to be examined is introduced through the upper opening while the liquid which has passed through the membrane is recovered by means of the output pipe. There also exists such a device provided for the sampling of a liquid under pressure, described in French patent 2 677 664.

The invention aims to make it possible to culture micro-organisms collected by filtration on the membrane under the best possible conditions.

To that end it proposes a device for microbiological examination of a sample of liquid, having an intake body, a filtering membrane and a drainage body having means of supporting said membrane on the opposite side from said intake body; characterised in that said support means have a concave surface facing said membrane.

By virtue of the concave nature of this surface, it is possible to avoid the creases which form on the membrane of the earlier devices, where the corresponding surface is flat, on account of the expansion which the membrane undergoes when it changes from the dry state to the wet state. Moreover, once the sampling has been performed, the membrane has a concave form on the intake side, that is to say on the side where any retained micro-organisms are present, the curvature of the membrane thus being in the correct direction where putting it down on the surface of the culture medium in the Petri dish is concerned, minimizing the risks of trapping one or more pocket(s) of air between the culture medium and the membrane, which are particularly dangerous since they can lead to false results, and in particular to the conclusion that the sample meets health standards whereas in reality the absence or the small quantity of micro-organisms on the membrane after incubation results from the fact that the membrane was isolated from the culture medium by the pocket or pockets of air.

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According to preferred characteristics in order to achieve the best cooperation between the membrane and the support means, the ratio of the difference between the length of the arc corresponding to the profile, in a diametral plane, of said surface of said support means and between the length of the chord of this arc, over the latter length, corresponds to the coefficient of expansion of said membrane between the dry state and the wet state.

According to other preferred characteristics, for reasons of simplicity and convenience, both in manufacture and in use, said support means are formed by a porous pad.

According to other preferred characteristics, said drainage body has an output aperture in the continuation of the internal passage of a coaxially disposed output pipe with preferably the drainage body having, around said output pipe, an annular rib tapering towards its end.

It is then possible to drain the device as described above by placing it on a vacuum flask with said output pipe engaged in the central hole of the stopper of said flask and said annular rib resting on this stopper.

The invention also relates, in a second aspect, to this drainage method.

It should be noted that it is also possible to use this method and provide the arrangement described above of the output pipe and the annular rib

of the drainage body, in any device for microbiological examination of a liquid, including one with a means of supporting the membrane whose surface is flat.

The explanation of the invention will now be continued with the description of an example embodiment, given below as a non-limitative illustration, with reference to the accompanying drawings. In these:

- Figure 1 is an elevational view of a device in accordance with the invention;
  - Figure 2 is a sectional elevational view of this device;
- Figures 3 and 4 are similar views but showing, respectively, only
   the intake body and the drainage body;
  - Figure 5 is an enlargement of the part of Figure 2 situated at the bottom right;
  - Figure 6 is a partial sectional elevational view of the seal with which the intake body is provided;
  - Figure 7 is a sectional elevational view showing how the device according to the invention is used for sampling the liquid to be examined;
  - Figure 8 is a similar view showing how the device in accordance with the invention is drained, after a sample has been taken, by means of a syringe;
  - Figure 9 is the corresponding top view, a second possible location for the syringe being shown with a syringe partially illustrated;
    - Figure 10 is a view similar to Figure 8, where the drainage is performed with a vacuum flask;
  - Figures 11 and 12 are sectional elevational views showing how the latching tabs are broken off the intake body in order to release the latter from the drainage body;
  - Figure 13 shows how the membrane is recovered with tweezers after this release; and
    - Figure 14 shows how the membrane is deposited in a Petri dish.

The device 1 for microbiological examination of a sample of liquid under pressure shown in the drawings, and notably in Figures 1 and 2, has in

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general terms a symmetry of revolution around a central axis. It has an intake body 2, a drainage body 3 and a filtering membrane 4.

The intake body 2 has a reservoir 5, a skirt 6 which is connected externally to the reservoir 5 and four latching tabs 7 which extend projecting from the skirt 6, in an axial direction.

The reservoir 5 has an end wall 8 and a lateral wall 9.

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Two diametrically opposite pipes 10 extend projecting outward from the lateral wall 9, above the skirt 6, each of these pipes constituting a female Luer connector adapted to receive internally a male Luer connector, as will be explained below with the help of Figure 7, the passage internal to each pipe 10 being continued by an aperture 11 made in the wall 9, this aperture being in immediate proximity to the end wall 8.

The lateral wall 9 finishes at the end opposite the end wall 8 in an edge forming part of a seal 13, a groove 14 being made to that effect in the rigid part of the wall 9, as will be explained in more detail subsequently with the help of Figures 2, 3 and 6.

The skirt 6 is connected to the reservoir 5 by the outside of the lateral wall 9, at a level situated between the groove 14 and the pipes 10, the skirt 6 having a truncated-cone shaped wall 15 and a cylindrical wall 16, the skirt 6 being connected to the wall 9 by the small-diameter end of the wall 15 while the connection between the walls 15 and 16 is made by the large-diameter end of the wall 15, the connection between the walls 15 and 16 being situated approximately at the level of the edge of the wall 9.

Each of the latching tabs 7 has a general outline in the form of a trapezium symmetrical with respect to the axial direction, the side forming the free end 18 of the tab 7 being parallel to the one by which this tab is connected to the skirt 6, and more precisely to the edge of the wall 16, the tab 7 narrowing steadily between its connection to the skirt 6 and its free end.

On either side of each tab 7, a notch 17 is made in the wall 16, over a certain distance from the edge thereof.

Each tab 7 has, from its free end 18, an internal surface 19 which is straight, that is to say parallel to the axial direction, as far as a dihedral 20 from which the surface 19 is inclined inward and towards the wall 16.

As for the external surface 21 of each tab 16, this is inclined outward and towards the wall 16, the surface 21 extending between the surface 18 and a transversely oriented surface 22 which connects the surface 21 and a groove 23 situated between an external shoulder 24 whose surface 22 constitutes the edge and a surface 25 offset inward with respect to the surface 21, the surface 25 being in the continuation of the external surface of the wall 16.

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It should be noted that the portion of each tab 7 situated between the bottom of the groove 23 and the edge of the wall 16 has a thickness which is a minimum at the level of the dihedral 20.

Consequently, it is in the region of the dihedral 20 that the tab 7 breaks if a sufficiently large pressure is exerted on the surface 21, and more generally if there is exerted on the tab 7 a radial force directed inward, the force necessary for breaking the tab 7 being smaller the closer it is applied to the end surface 18.

As can be seen more particularly in Figure 1, the surface 21 has edges parallel to the axial direction, each tab 7 having a notch 26 with an L-shaped profile between the lateral edges of the surface 21 and the lateral edges of the tab 7.

As can be seen better in Figure 4, the drainage body 3 has a circular table 30 and a skirt 31 disposed in a step around the table 30.

The latter has an annular transverse wall 32 delimited on the opposite side from the skirt 31 by a surface 33, which is flat in the main but having a slight bevel towards the outside.

The internal periphery of the wall 32 is connected to a wall 34 delimited, on the side of the surface 33, by a surface 35 which is concave in the main, offset with respect to the surface 32 in the axial direction, towards the skirt 31, the perimeter of the surface 35 and the internal periphery of the surface 33 being connected by a slightly truncated-cone shaped surface 36.

The wall 34 is connected centrally to a pipe 37 whose internal passage is extended into the wall 34 by an output aperture 38, concentric drainage channels 39 being put into the wall 34 from the surface 35, radially oriented channels (not visible in the drawings) also being made, with the same depth as the channels 39, these radial channels opening of course into the output aperture 38, through which, therefore, there flows out all the liquid drained by the channels made in the wall 34 hollowed out with respect to the surface 35.

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At the junction between the walls 32 and 34 there is situated an annular rib 40 which projects with respect to the walls 32 and 34 on the side of the skirt 31, this rib tapering towards its free end in a V-shaped profile, so that this end constitutes a sharp edge.

The table 30 also has a tubular lateral wall 41 which is connected by one end to the wall 32 while, by the other end, it is connected to the skirt 31.

The latter has a transversely oriented annular wall 42 and an axially oriented cylindrical wall 43, the wall 42 being connected by one of its ends to the wall 41 and by the other to the wall 43.

In the wall 42, in proximity to the wall 41, four openings 44 are made, which have between them the same angular spacing as between the latching tabs 7, that is to say they are spaced out from one another by 90°, these openings having an outline corresponding to the largest outline of the tabs 7, so that the latter can each pass through a respective opening 44.

Each opening 44 is bordered on the external side by an axially oriented tooth 45 projecting on the opposite side from the table 30.

Each tooth 45 extends projecting over a height corresponding to the depth of the groove 23 and has a thickness less than the width of the groove 23, the distance separating each tooth 45 from the wall 43 being greater than the thickness of the shoulder 24 (see Figure 5).

At the level of each opening 44, the wall 43 has a notch 46 of general rectangular form with rounded corners, extending over approximately two thirds of the height of the wall 43 and over a width which is approximately twice the width of the latching tabs 7.

The wall 43 also has four notches 47, each disposed halfway between two successive notches 46, the notches 47 having a rounded form whose maximum height corresponds approximately to one third of the height of the wall 43.

The drainage body 3 also has a porous pad 48 (not depicted in Figure 4), which has a constant thickness with two opposite surfaces of the same form as the surface 35, its diameter and thickness being the same as those of the surface 36.

When the filtration body 2, the drainage body 3 and the membrane 4 are assembled, as shown notably in Figures 1 and 2, the membrane 4 is gripped between the edge of the lateral wall 9 of the reservoir 5 of the intake body 2 and the surface 33 of the wall 32 of the circular table 30 of the drainage body 3, the bodies 2 and 3 being locked to one another by virtue of the latching tabs 7 and the skirt 31, which are mutually disposed as can be seen more particularly in Figure 5.

It should be noted that the tooth 45 of the wall 42 fits into the groove 23 of the tab 7 and that the shoulder 24 of this tab fits into the space situated between the wall 43 and the tooth 45, so that the cooperation between the shoulder 24 and the tooth 45 provides an extremely powerful locking of the tab 7 in the skirt 31, capable of withstanding relatively large forces tending to move the bodies 2 and 3 away from one another.

It should also be noted that the end 18 of the tab 7 is recessed with respect to the free end of the wall 43, so that, when the device 1 is put down on a surface with the drainage body 3 at the bottom, it is by means of the skirt 31 thereof that the device 1 rests on this surface, no force being exerted for this reason on the tabs 7, which therefore do not risk being broken accidentally.

As can be seen in Figure 2, when the device 1 is assembled, the seal 13, and more particularly the cushion thereof, is highly compressed compared with the off-load form of this seal shown in Figure 6.

As indicated above, this seal has a T-shaped general profile whose longitudinal branch forms a rib 50 designed to be inserted into the groove 14

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and whose transverse branch forms a cushion 51 designed to enter into contact with the membrane 4.

The free end of the cushion 51 has a central slot 52 which makes it possible to release two annular lips 53 allowing the best cooperation of the cushion 51 with the membrane 4.

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It should be noted that the junction between the rib 50 and the cushion 51 is made by a straight surface on the internal side while, on the external side, there is a bevel 54.

This bevel in fact corresponds to a chamfered lip 55 at the external periphery of the end of the rigid part of the wall 9, this chamfered lip making it possible to laterally contain the cushion 51 on the external side in order that it flows mainly inward, that is to say towards the chamber delimited by the membrane 4 and the reservoir 5.

The intake body 2 is obtained, with the exception of the seal 13, by moulding of a relatively rigid and transparent plastic, and then there is moulded, on to this piece, the seal 13, which is made of elastomer, this over-moulding being carried out in the example illustrated by bi-injection.

The part of the drainage body 3 depicted in Figure 4 is also made of relatively rigid moulded plastic, here white in colour, this part being next equipped, by simple fitting, with the porous pad 48.

In order to assemble the intake body 1, the drainage body 3 and the membrane 4, the latter is put on the table 30, concentrically therewith, then the intake body 2 is positioned facing the drainage body 3 with the latching tabs 7 aligned with the openings 44, then the body 2 is pressed hard towards the body 3 so that the tabs 7 engage in the openings 44 flexing slightly by virtue of the inclined surface 21 which acts as a ramp, the force exerted allowing the surface 22 of the shoulder 24 to get over the tooth 45 at the end of the pushing in movement, by virtue of the spring of the tabs 7, the seal 13 next relaxing slightly so that the play between the tabs 7 and the skirt 31 is completely taken up, the elasticity of the seal 13, which is then compressed, maintaining the locking thus obtained.

It should be noted that the maintaining of the seal in the compressed state allows it to offer excellent sealing between the membrane 4 and the edge of the wall 9, and furthermore, by reaction, between the membrane 4 and the surface 33.

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It should also be noted that the internal surface of the wall 16 has localized areas of extra thickness 27 (Figure 3) coming into contact with the external surface of the wall 41, which provides a lateral wedging between these surfaces, which are of similar diameter, and more generally between the bodies 2 and 3.

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Finally it should be noted that, once the device 1 has been assembled in this way, it is possible to package it and sterilize it with a gas such as ETO or by irradiation.

Of course, before packaging the assembled device 1 and sterilizing it, each of the pipes 10 and 37 is equipped with a stopper.

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There will now be explained how the sampling of a liquid under pressure is carried out with the device 1.

First of all the stopper blocking off one of the pipes 10 and the stopper blocking off the pipe 37 are removed, then the unstoppered pipe 10 is connected to a source of liquid under pressure, for example using, as shown in Figure 7, a sampling connector 60 having a male Luer tip 61, which is inserted into the passage of the unstoppered pipe 10 and the valve 62 of the connector 60 is manipulated, so that the chamber formed by the reservoir 5 and the membrane 4 is raised to the same pressure as the liquid, for example 3 bars, the liquid entering the reservoir 5 through the aperture 11 and leaving the reservoir by passing through the membrane 4, which comes to rest on the porous pad 48, the liquid which has passed through the membrane 4 being guided by the channels 39 to the aperture 38, the liquid leaving the device 1 by the pipe 37, a graduated container being preferably disposed under the device 1 in order to recover the liquid coming out of the pipe 37 in order to know when the volume required for the sample has passed through the membrane 4.

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When this volume has been reached, the valve 62 is closed and the device 1 is removed from the connector 60, then there is put in place, in the

unstoppered pipe 10, an air sterilization filter 63 (depicted in Figure 10 but not in Figure 8), and the drainage of the liquid still present notably in the reservoir 5 is next carried out, by suction through the output aperture 38.

In the example shown in Figure 8, the drainage is performed with a syringe or pump 64 having a connector 65 provided with a suction tip 66 which has been inserted into the passage of the pipe 37, the liquid sucked out by the tip 66 being expelled by the tip 67 when the shaft 69 is pushed into the body 68, by pressing on the plunger 70.

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It should be noted that the notches 47 made in the wall 43 make it possible to correctly position the pump or syringe 64 in relation to the device 1, in four positions at 90° from one another, two of these positions being shown in Figure 8.

Another possibility for extracting the liquid remaining in the device 1 after sampling, is to use a vacuum flask, as shown in Figure 10.

The vacuum flask 71 illustrated has a glass body 72 having, at the level of its neck, a pipe 73 connected, in a manner not depicted, to a vacuum pump, and, at the top of this neck, a flexible stopper 74 with a central aperture 75 made in it, the flask 71 being of a type which is commonly found in practice.

The device 1 is simply put down on the stopper 74, with the pipe 37 engaged in the aperture 75 and the rib 40 supported on the top of the stopper 74.

On account of the tapered profile of the rib 40, the latter locally deforms the stopper 74 and provides sealing which makes it possible to suck out the residual liquid, as drawn.

Once the liquid remaining in the device 1 has been emptied therefrom, the device 1 can be opened, which is performed by breaking the four latching tabs 7, by simple pressure on said tabs through the respective notches 46, as explained above and illustrated in Figures 11 and 12.

It is then possible to remove the intake body 2 from the drainage body 3 and pick up the membrane 4, for example with sterile tweezers 80, as shown in Figure 13, then deposit the membrane through which the sample to be

examined has passed, in a Petri dish 81, as shown in Figure 14, then carry out conventionally the incubation of the membrane/Petri dish assembly.

It should be noted that the concavity of the surface 35 has been calculated so that the ratio of the difference between the length of the arc corresponding to the profile, in a diametral plane, of the surface of the pad 48 facing the membrane 4 and between the length of the chord of this arc, over the latter length, corresponds to the coefficient of expansion of the membrane 4 between the dry state and the wet state.

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The result thereof is that the expansion of the membrane 4, when it changes from the dry state to the wet state, corresponds precisely to the difference in length between the arc corresponding to the above-mentioned profile and the chord of this arc, so that, in the wet state, the membrane 4 rests perfectly on the pad 48, with no creases. The pad 48 therefore provides a particularly effective support for the membrane 4 when it is subjected to the difference in pressure which allows the liquid to flow through it.

Moreover, when the user recovers the membrane 4 with the tweezers 80 as shown in Figure 13, this membrane has a concave form, on the side where the reservoir 5 is situated, that is to say on the side where any micro-organisms retained by the membrane at the time of sampling are present, the curvature of the membrane 4 thus being in the correct direction where putting it down on the surface of the culture medium 82 in the dish 81 is concerned.

This is because, when the membrane 4 is positioned on the dish 81, it is the convex side of the membrane 4 which faces the surface of the medium 82, so that, putting down the membrane 4 on the medium 82 from a portion of the membrane opposite the tweezers 80 and moving them so that the membrane progressively comes into contact with the medium 82 to the place where it is held by the tweezers. The risk that the membrane has one or more hollows on the opposite side from the medium 82, and therefore the risk that it develops one or more pocket(s) of air between the membrane 4 and the medium 82, are thus zero or at any rate minimal.

The culture medium 82 in the dish 81 illustrated in Figure 14 is a culture medium containing agar-agar, used in the solid state after having been poured into the dish hot.

If it is wished to use a liquid culture medium, it is possible to replace the Petri dish 81 with a similar dish but one where the agar-agar culture medium 82 is replaced by an absorbent pad impregnated with liquid culture medium.

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Another possibility, rather than culturing the micro-organisms outside the device 1, is to inject liquid culture medium therein using one of the pipes 10, then to drain the excess culture medium using the pipe 37, and to next put the device 1 to incubate directly, the membrane 4 being recovered only in order to identify and count the micro-organisms after incubation.

In such a case, there is an advantage in using a liquid culture medium which is slightly more concentrated than the conventional media since there always remains, notably in the pad 48, a certain amount of the sampled liquid which mixes with the injected culture medium which is therefore diluted.

In a variant, not depicted, the device according to the invention is designed to work by gravity, and therefore has a different intake body.

Many other variants are possible depending on circumstances, and it should be stated in this respect that the invention is not limited to the examples described and depicted.

#### **CLAIMS**

1. Device for microbiological examination of a sample of liquid, having an intake body, a filtering membrane and a drainage body having means of supporting said membrane on the opposite side from said intake body; characterised in that said support means (48) have a concave surface facing said membrane (4).

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- 2. Device according to Claim 1, characterised in that the ratio of the difference between the length of the arc corresponding to the profile, in a diametral plane, of said surface of said support means (48) and between the length of the chord of this arc, over the latter length, corresponds to the coefficient of expansion of said membrane (4) between the dry state and the wet state.
- 3. Device according to either one of Claims 1 or 2, characterised in that said support means are formed by a porous pad (48).
- 4. Device according to Claim 3, characterised in that said drainage body (3) has drainage channels (39) under said porous pad (48), said drainage channels opening into an output aperture (38).
- 5. Device according to any one of Claims 1 to 4, characterised in that said drainage body (3) has a circular table (30) provided at its centre with said means of supporting (48) said membrane (4) and having, around said support means (48), a wall (32) having a surface (33) situated facing said elastomer seal (13), which forms part of said intake body (2), said membrane (4) being squeezed between said surface (33) and said seal (13).
- 6. Device according to Claim 5, characterised in that the external diameter of said circular table (30) corresponds substantially to the internal diameter of a skirt (6) included in said intake body (2), said skirt (6) encircling said circular table (30).
- Device according to Claim 6, characterised in that areas of extra thickness for wedging (27) are provided between said circular table (30) and
   said skirt (6).

- 8. Device according to any one of Claims 5 to 7, characterised in that said drainage body has a skirt (31) disposed in a step with respect to said circular table (30).
- 9. Device according to Claim 8, characterised in that said skirt (31) has means of latching (42, 44, 45) with said intake body (2).
  - 10. Device according to either one of Claims 8 or 9, characterised in that said skirt (31) of the drainage body (3) has at least one notch (47) adapted to allow the placing of a drainage syringe (64).
- 11. Device according to any one of Claims 1 to 10, characterised in that said drainage body (3) has an output aperture (38) in the continuation of the internal passage of a coaxially disposed output pipe (37).
  - 12. Device according to Claim 11, characterised in that said drainage body (3) has, around said output pipe (37), an annular rib (40) tapering towards its end.
- 13. Method for draining a device according to Claim 12, characterised in that it is placed on a vacuum flask (71) with said output pipe (37) engaged in the central hole (75) of the stopper (74) of said flask and said annular rib (40) resting on this stopper.

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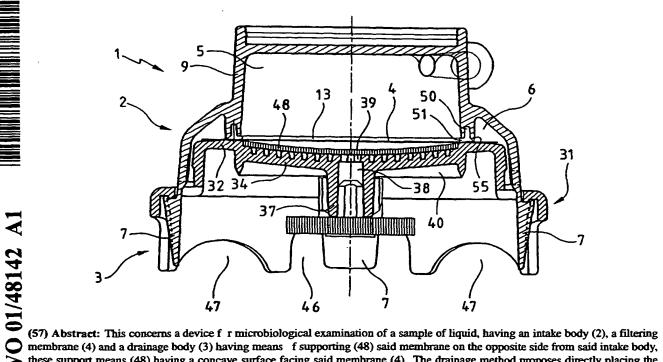
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these support means (48) having a concave surface facing said membrane (4). The drainage method proposes directly placing the device on a vacuum flask, the sealing of the stopper of said flask being obtained by a rib (40) tapering towards its end.



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# "Device for microbiological examination of a sample of liquid and method for draining this device"

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The invention relates to the devices for microbiological examination of a sample of liquid.

Such devices are already known, which have an intake body, a filtering membrane and a drainage body designed to support the membrane on the opposite side from the intake body.

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In general, these devices work by simple gravity and have the general form of a funnel into which the sample to be examined is introduced through the upper opening while the liquid which has passed through the membrane is recovered by means of the output pipe. There also exists such a device provided for the sampling of a liquid under pressure, described in French patent 2 677 664.

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The invention aims to make it possible to culture micro-organisms collected by filtration on the membrane under the best possible conditions.

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To that end it proposes a device for microbiological examination of a sample of liquid, having an intake body, a filtering membrane and a drainage body having means of supporting said membrane on the opposite side from said intake body; characterised in that said support means have a concave surface facing said membrane.

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By virtue of the concave nature of this surface, it is possible to avoid the creases which form on the membrane of the earlier devices, where the corresponding surface is flat, on account of the expansion which the membrane undergoes when it changes from the dry state to the wet state.

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Moreover, once the sampling has been performed, the membrane has a concave form on the intake side, that is to say on the side where any retained micro-organisms are present, the curvature of the membrane thus being in the correct direction where putting it down on the surface of the culture medium in the Petri dish is concerned, minimizing the risks of trapping one or more pocket(s) of air between the culture medium and the membrane, which are particularly dangerous since they can lead to false results, and in particular to the conclusion that the sample meets health standards whereas in reality the absence or the small quantity of micro-organisms on the membrane after incubation results from the fact that the membrane was isolated from the culture medium by the pocket or pockets of air.

According to preferred characteristics in order to achieve the best cooperation between the membrane and the support means, the ratio of the difference between the length of the arc corresponding to the profile, in a diametral plane, of said surface of said support means and between the length of the chord of this arc, over the latter length, corresponds to the coefficient of expansion of said membrane between the dry state and the wet state.

According to other preferred characteristics, for reasons of simplicity and convenience, both in manufacture and in use, said support means are formed by a porous pad.

According to other preferred characteristics, said drainage body has an output aperture in the continuation of the internal passage of a coaxially disposed output pipe with preferably the drainage body having, around said output pipe, an annular rib tapering towards its end.

It is then possible to drain the device as described above by placing it on a vacuum flask with said output pipe engaged in the central hole of the stopper of said flask and said annular rib resting on this stopper.

The invention also relates, in a second aspect, to this drainage method.

It should be noted that it is also possible to use this method and provide the arrangement described above of the output pipe and the annular rib

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of the drainage body, in any device for microbiological examination of a liquid, including one with a means of supporting the membrane whose surface is flat.

The explanation of the invention will now be continued with the description of an example embodiment, given below as a non-limitative illustration, with reference to the accompanying drawings. In these:

- Figure 1 is an elevational view of a device in accordance with the invention:
  - Figure 2 is a sectional elevational view of this device;
- Figures 3 and 4 are similar views but showing, respectively, only
   the intake body and the drainage body;
  - Figure 5 is an enlargement of the part of Figure 2 situated at the bottom right;
  - Figure 6 is a partial sectional elevational view of the seal with which the intake body is provided;
  - Figure 7 is a sectional elevational view showing how the device according to the invention is used for sampling the liquid to be examined;
  - Figure 8 is a similar view showing how the device in accordance with the invention is drained, after a sample has been taken, by means of a syringe;
  - Figure 9 is the corresponding top view, a second possible location for the syringe being shown with a syringe partially illustrated;
  - Figure 10 is a view similar to Figure 8, where the drainage is performed with a vacuum flask;
  - Figures 11 and 12 are sectional elevational views showing how the latching tabs are broken off the intake body in order to release the latter from the drainage body;
    - Figure 13 shows how the membrane is recovered with tweezers after this release; and
      - Figure 14 shows how the membrane is deposited in a Petri dish.
- The device 1 for microbiological examination of a sample of liquid under pressure shown in the drawings, and notably in Figures 1 and 2, has in

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general terms a symmetry of revolution around a central axis. It has an intake body 2, a drainage body 3 and a filtering membrane 4.

The intake body 2 has a reservoir 5, a skirt 6 which is connected externally to the reservoir 5 and four latching tabs 7 which extend projecting from the skirt 6, in an axial direction.

The reservoir 5 has an end wall 8 and a lateral wall 9.

Two diametrically opposite pipes 10 extend projecting outward from the lateral wall 9, above the skirt 6, each of these pipes constituting a female Luer connector adapted to receive internally a male Luer connector, as will be explained below with the help of Figure 7, the passage internal to each pipe 10 being continued by an aperture 11 made in the wall 9, this aperture being in immediate proximity to the end wall 8.

The lateral wall 9 finishes at the end opposite the end wall 8 in an edge forming part of a seal 13, a groove 14 being made to that effect in the rigid part of the wall 9, as will be explained in more detail subsequently with the help of Figures 2, 3 and 6.

The skirt 6 is connected to the reservoir 5 by the outside of the lateral wall 9, at a level situated between the groove 14 and the pipes 10, the skirt 6 having a truncated-cone shaped wall 15 and a cylindrical wall 16, the skirt 6 being connected to the wall 9 by the small-diameter end of the wall 15 while the connection between the walls 15 and 16 is made by the large-diameter end of the wall 15, the connection between the walls 15 and 16 being situated approximately at the level of the edge of the wall 9.

Each of the latching tabs 7 has a general outline in the form of a trapezium symmetrical with respect to the axial direction, the side forming the free end 18 of the tab 7 being parallel to the one by which this tab is connected to the skirt 6, and more precisely to the edge of the wall 16, the tab 7 narrowing steadily between its connection to the skirt 6 and its free end.

On either side of each tab 7, a notch 17 is made in the wall 16, over a certain distance from the edge thereof.

Each tab 7 has, from its free end 18, an internal surface 19 which is straight, that is to say parallel to the axial direction, as far as a dihedral 20 from which the surface 19 is inclined inward and towards the wall 16.

As for the external surface 21 of each tab 16, this is inclined outward and towards the wall 16, the surface 21 extending between the surface 18 and a transversely oriented surface 22 which connects the surface 21 and a groove 23 situated between an external shoulder 24 whose surface 22 constitutes the edge and a surface 25 offset inward with respect to the surface 21, the surface 25 being in the continuation of the external surface of the wall 16.

It should be noted that the portion of each tab 7 situated between the bottom of the groove 23 and the edge of the wall 16 has a thickness which is a minimum at the level of the dihedral 20.

Consequently, it is in the region of the dihedral 20 that the tab 7 breaks if a sufficiently large pressure is exerted on the surface 21, and more generally if there is exerted on the tab 7 a radial force directed inward, the force necessary for breaking the tab 7 being smaller the closer it is applied to the end surface 18.

As can be seen more particularly in Figure 1, the surface 21 has edges parallel to the axial direction, each tab 7 having a notch 26 with an L-shaped profile between the lateral edges of the surface 21 and the lateral edges of the tab 7.

As can be seen better in Figure 4, the drainage body 3 has a circular table 30 and a skirt 31 disposed in a step around the table 30.

The latter has an annular transverse wall 32 delimited on the opposite side from the skirt 31 by a surface 33 which is flat in the main but having a slight bevel towards the outside.

The internal periphery of the wall 32 is connected to a wall 34 delimited, on the side of the surface 33, by a surface 35 which is concave in the main, offset with respect to the surface 32 in the axial direction, towards the skirt 31, the perimeter of the surface 35 and the internal periphery of the surface 33 being connected by a slightly truncated-cone shaped surface 36.



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The wall 34 is connected centrally to a pipe 37 whose internal passage is extended into the wall 34 by an output aperture 38, concentric drainage channels 39 being put into the wall 34 from the surface 35, radially oriented channels (not visible in the drawings) also being made, with the same depth as the channels 39, these radial channels opening of course into the output aperture 38, through which, therefore, there flows out all the liquid drained by the channels made in the wall 34 hollowed out with respect to the surface 35.

At the junction between the walls 32 and 34 there is situated an annular rib 40 which projects with respect to the walls 32 and 34 on the side of the skirt 31, this rib tapering towards its free end in a V-shaped profile, so that this end constitutes a sharp edge.

The table 30 also has a tubular lateral wall 41 which is connected by one end to the wall 32 while, by the other end, it is connected to the skirt 31.

The latter has a transversely oriented annular wall 42 and an axially oriented cylindrical wall 43, the wall 42 being connected by one of its ends to the wall 41 and by the other to the wall 43.

In the wall 42, in proximity to the wall 41, four openings 44 are made, which have between them the same angular spacing as between the latching tabs 7, that is to say they are spaced out from one another by 90°, these openings having an outline corresponding to the largest outline of the tabs 7, so that the latter can each pass through a respective opening 44.

Each opening 44 is bordered on the external side by an axially oriented tooth 45 projecting on the opposite side from the table 30.

Each tooth 45 extends projecting over a height corresponding to the depth of the groove 23 and has a thickness less than the width of the groove 23, the distance separating each tooth 45 from the wall 43 being greater than the thickness of the shoulder 24 (see Figure 5).

At the level of each opening 44, the wall 43 has a notch 46 of general rectangular form with rounded corners, extending over approximately two thirds of the height of the wall 43 and over a width which is approximately twice the width of the latching tabs 7.

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The wall 43 also has four notches 47, each disposed halfway between two successive notches 46, the notches 47 having a rounded form whose maximum height corresponds approximately to one third of the height of the wall 43.

The drainage body 3 also has a porous pad 48 (not depicted in Figure 4), which has a constant thickness with two opposite surfaces of the same form as the surface 35, its diameter and thickness being the same as those of the surface 36.

When the filtration body 2, the drainage body 3 and the membrane 4 are assembled, as shown notably in Figures 1 and 2, the membrane 4 is gripped between the edge of the lateral wall 9 of the reservoir 5 of the intake body 2 and the surface 33 of the wall 32 of the circular table 30 of the drainage body 3, the bodies 2 and 3 being locked to one another by virtue of the latching tabs 7 and the skirt 31, which are mutually disposed as can be seen more particularly in Figure 5.

It should be noted that the tooth 45 of the wall 42 fits into the groove 23 of the tab 7 and that the shoulder 24 of this tab fits into the space situated between the wall 43 and the tooth 45, so that the cooperation between the shoulder 24 and the tooth 45 provides an extremely powerful locking of the tab 7 in the skirt 31, capable of withstanding relatively large forces tending to move the bodies 2 and 3 away from one another.

It should also be noted that the end 18 of the tab 7 is recessed with respect to the free end of the wall 43, so that, when the device 1 is put down on a surface with the drainage body 3 at the bottom, it is by means of the skirt 31 thereof that the device 1 rests on this surface, no force being exerted for this reason on the tabs 7, which therefore do not risk being broken accidentally.

As can be seen in Figure 2, when the device 1 is assembled, the seal 13, and more particularly the cushion thereof, is highly compressed compared with the off-load form of this seal shown in Figure 6.

As indicated above, this seal has a T-shaped general profile whose longitudinal branch forms a rib 50 designed to be inserted into the groove 14

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and whose transverse branch forms a cushion 51 designed to enter into contact with the membrane 4.

The free end of the cushion 51 has a central slot 52 which makes it possible to release two annular lips 53 allowing the best cooperation of the cushion 51 with the membrane 4.

It should be noted that the junction between the rib 50 and the cushion 51 is made by a straight surface on the internal side while, on the external side, there is a bevel 54.

This bevel in fact corresponds to a chamfered lip 55 at the external periphery of the end of the rigid part of the wall 9, this chamfered lip making it possible to laterally contain the cushion 51 on the external side in order that it flows mainly inward, that is to say towards the chamber delimited by the membrane 4 and the reservoir 5.

The intake body 2 is obtained, with the exception of the seal 13, by moulding of a relatively rigid and transparent plastic, and then there is moulded, on to this piece, the seal 13, which is made of elastomer, this over-moulding being carried out in the example illustrated by bi-injection.

The part of the drainage body 3 depicted in Figure 4 is also made of relatively rigid moulded plastic, here white in colour, this part being next equipped, by simple fitting, with the porous pad 48.

In order to assemble the intake body 1, the drainage body 3 and the membrane 4, the latter is put on the table 30, concentrically therewith, then the intake body 2 is positioned facing the drainage body 3 with the latching tabs 7 aligned with the openings 44, then the body 2 is pressed hard towards the body 3 so that the tabs 7 engage in the openings 44 flexing slightly by virtue of the inclined surface 21 which acts as a ramp, the force exerted allowing the surface 22 of the shoulder 24 to get over the tooth 45 at the end of the pushing in movement, by virtue of the spring of the tabs 7, the seal 13 next relaxing slightly so that the play between the tabs 7 and the skirt 31 is completely taken up, the elasticity of the seal 13, which is then compressed, maintaining the locking thus obtained.

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It should be noted that the maintaining of the seal in the compressed state allows it to offer excellent sealing between the membrane 4 and the edge of the wall 9, and furthermore, by reaction, between the membrane 4 and the surface 33.

It should also be noted that the internal surface of the wall 16 has localized areas of extra thickness 27 (Figure 3) coming into contact with the external surface of the wall 41, which provides a lateral wedging between these surfaces, which are of similar diameter, and more generally between the bodies 2 and 3.

Finally it should be noted that, once the device 1 has been assembled in this way, it is possible to package it and sterilize it with a gas such as ETO or by irradiation.

Of course, before packaging the assembled device 1 and sterilizing it, each of the pipes 10 and 37 is equipped with a stopper.

There will now be explained how the sampling of a liquid under pressure is carried out with the device 1.

First of all the stopper blocking off one of the pipes 10 and the stopper blocking off the pipe 37 are removed, then the unstoppered pipe 10 is connected to a source of liquid under pressure, for example using, as shown in Figure 7, a sampling connector 60 having a male Luer tip 61, which is inserted into the passage of the unstoppered pipe 10 and the valve 62 of the connector 60 is manipulated, so that the chamber formed by the reservoir 5 and the membrane 4 is raised to the same pressure as the liquid, for example 3 bars, the liquid entering the reservoir 5 through the aperture 11 and leaving the reservoir by passing through the membrane 4, which comes to rest on the porous pad 48, the liquid which has passed through the membrane 4 being guided by the channels 39 to the aperture 38, the liquid leaving the device 1 by the pipe 37, a graduated container being preferably disposed under the device 1 in order to recover the liquid coming out of the pipe 37 in order to know when the volume required for the sample has passed through the membrane 4.

When this volume has been reached, the valve 62 is closed and the device 1 is removed from the connector 60, then there is put in place, in the

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unstoppered pipe 10, an air sterilization filter 63 (depicted in Figure 10 but not in Figure 8), and the drainage of the liquid still present notably in the reservoir 5 is next carried out, by suction through the output aperture 38.

In the example shown in Figure 8, the drainage is performed with a syringe or pump 64 having a connector 65 provided with a suction tip 66 which has been inserted into the passage of the pipe 37, the liquid sucked out by the tip 66 being expelled by the tip 67 when the shaft 69 is pushed into the body 68, by pressing on the plunger 70.

It should be noted that the notches 47 made in the wall 43 make it possible to correctly position the pump or syringe 64 in relation to the device 1, in four positions at 90° from one another, two of these positions being shown in Figure 8.

Another possibility for extracting the liquid remaining in the device 1 after sampling, is to use a vacuum flask, as shown in Figure 10.

The vacuum flask 71 illustrated has a glass body 72 having, at the level of its neck, a pipe 73 connected, in a manner not depicted, to a vacuum pump, and, at the top of this neck, a flexible stopper 74 with a central aperture 75 made in it, the flask 71 being of a type which is commonly found in practice.

The device 1 is simply put down on the stopper 74, with the pipe 37 engaged in the aperture 75 and the rib 40 supported on the top of the stopper 74.

On account of the tapered profile of the rib 40, the latter locally deforms the stopper 74 and provides sealing which makes it possible to suck out the residual liquid, as drawn.

Once the liquid remaining in the device 1 has been emptied therefrom, the device 1 can be opened, which is performed by breaking the four latching tabs 7, by simple pressure on said tabs through the respective notches 46, as explained above and illustrated in Figures 11 and 12.

It is then possible to remove the intake body 2 from the drainage body 3 and pick up the membrane 4, for example with sterile tweezers 80, as shown in Figure 13, then deposit the membrane through which the sample to be

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examined has passed, in a Petri dish 81, as shown in Figure 14, then carry out conventionally the incubation of the membrane/Petri dish assembly.

It should be noted that the concavity of the surface 35 has been calculated so that the ratio of the difference between the length of the arc corresponding to the profile, in a diametral plane, of the surface of the pad 48 facing the membrane 4 and between the length of the chord of this arc, over the latter length, corresponds to the coefficient of expansion of the membrane 4 between the dry state and the wet state.

The result thereof is that the expansion of the membrane 4, when it changes from the dry state to the wet state, corresponds precisely to the difference in length between the arc corresponding to the above-mentioned profile and the chord of this arc, so that, in the wet state, the membrane 4 rests perfectly on the pad 48, with no creases. The pad 48 therefore provides a particularly effective support for the membrane 4 when it is subjected to the difference in pressure which allows the liquid to flow through it.

Moreover, when the user recovers the membrane 4 with the tweezers 80 as shown in Figure 13, this membrane has a concave form, on the side where the reservoir 5 is situated, that is to say on the side where any micro-organisms retained by the membrane at the time of sampling are present, the curvature of the membrane 4 thus being in the correct direction where putting it down on the surface of the culture medium 82 in the dish 81 is concerned.

This is because, when the membrane 4 is positioned on the dish 81, it is the convex side of the membrane 4 which faces the surface of the medium 82, so that, putting down the membrane 4 on the medium 82 from a portion of the membrane opposite the tweezers 80 and moving them so that the membrane progressively comes into contact with the medium 82 to the place where it is held by the tweezers. The risk that the membrane has one or more hollows on the opposite side from the medium 82, and therefore the risk that it develops one or more pocket(s) of air between the membrane 4 and the medium 82, are thus zero or at any rate minimal.

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The culture medium 82 in the dish 81 illustrated in Figure 14 is a culture medium containing agar-agar, used in the solid state after having been poured into the dish hot.

If it is wished to use a liquid culture medium, it is possible to replace the Petri dish 81 with a similar dish but one where the agar-agar culture medium 82 is replaced by an absorbent pad impregnated with liquid culture medium.

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Another possibility, rather than culturing the micro-organisms outside the device 1, is to inject liquid culture medium therein using one of the pipes 10, then to drain the excess culture medium using the pipe 37, and to next put the device 1 to incubate directly, the membrane 4 being recovered only in order to identify and count the micro-organisms after incubation.

In such a case, there is an advantage in using a liquid culture medium which is slightly more concentrated than the conventional media since there always remains, notably in the pad 48, a certain amount of the sampled liquid which mixes with the injected culture medium which is therefore diluted.

In a variant, not depicted, the device according to the invention is designed to work by gravity, and therefore has a different intake body.

Many other variants are possible depending on circumstances, and it should be stated in this respect that the invention is not limited to the examples described and depicted.

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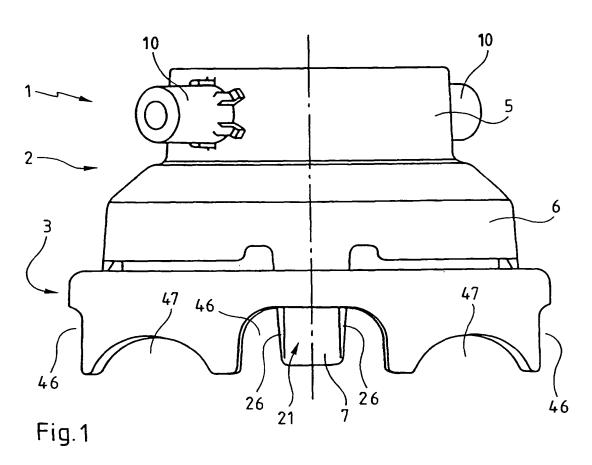
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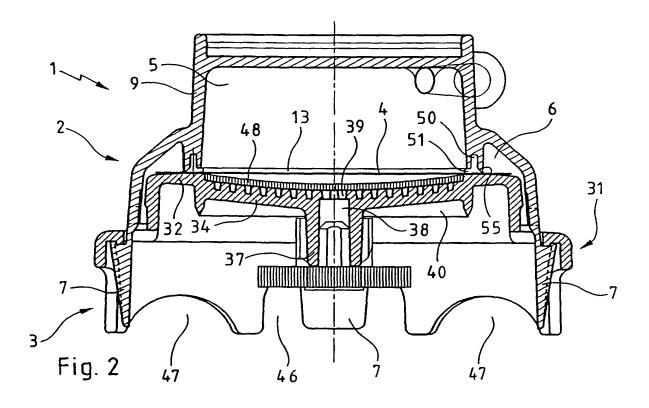
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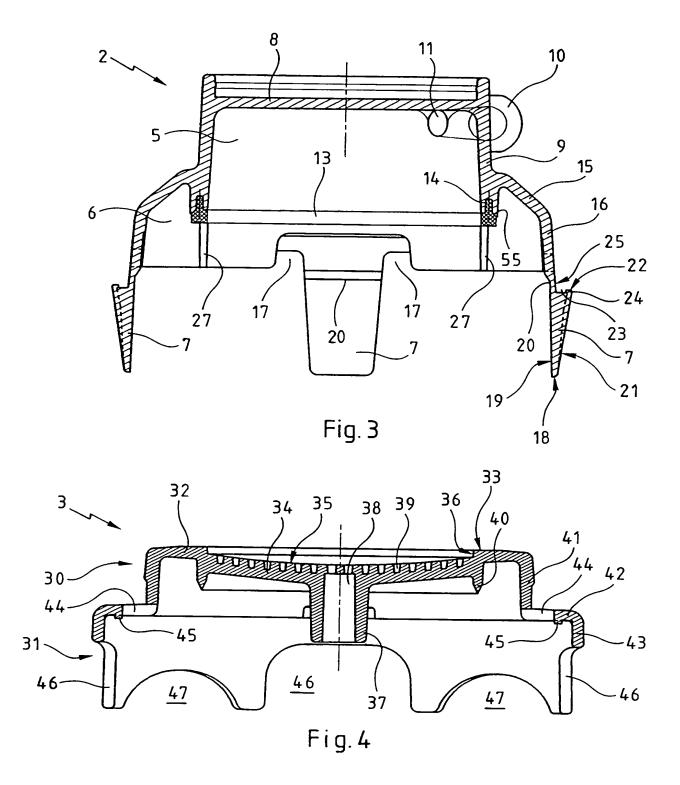
#### CLAIMS

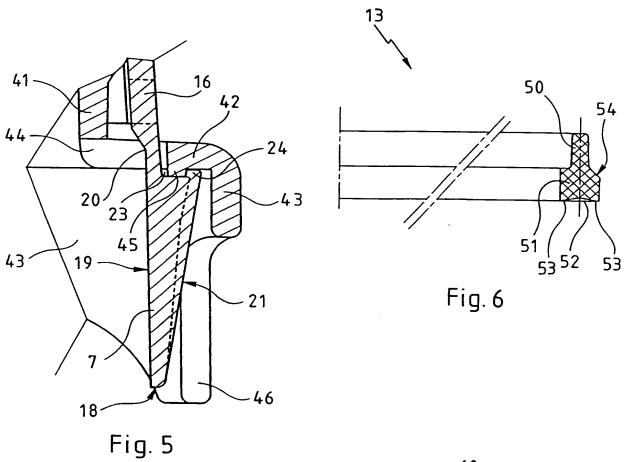
- 1. Device for microbiological examination of a sample of liquid, having an intake body, a filtering membrane and a drainage body having means of supporting said membrane on the opposite side from said intake body; characterised in that said support means (48) have a concave surface facing said membrane (4).
- 2. Device according to Claim 1, characterised in that the ratio of the difference between the length of the arc corresponding to the profile, in a diametral plane, of said surface of said support means (48) and between the length of the chord of this arc, over the latter length, corresponds to the coefficient of expansion of said membrane (4) between the dry state and the wet state.
- 3. Device according to either one of Claims 1 or 2, characterised in that said support means are formed by a porous pad (48).
- 4. Device according to Claim 3, characterised in that said drainage body (3) has drainage channels (39) under said porous pad (48), said drainage channels opening into an output aperture (38).
  - 5. Device according to any one of Claims 1 to 4, characterised in that said drainage body (3) has a circular table (30) provided at its centre with said means of supporting (48) said membrane (4) and having, around said support means (48), a wall (32) having a surface (33) situated facing said elastomer seal (13), which forms part of said intake body (2), said membrane (4) being squeezed between said surface (33) and said seal (13).
- 6. Device according to Claim 5, characterised in that the external diameter of said circular table (30) corresponds substantially to the internal diameter of a skirt (6) included in said intake body (2), said skirt (6) encircling said circular table (30).
- 7. Device according to Claim 6, characterised in that areas of extra thickness for wedging (27) are provided between said circular table (30) and said skirt (6).

- 8. Device according to any one of Claims 5 to 7, characterised in that said drainage body has a skirt (31) disposed in a step with respect to said circular table (30).
- 9. Device according to Claim 8, characterised in that said skirt (31) has means of latching (42, 44, 45) with said intake body (2).
- 10. Device according to either one of Claims 8 or 9, characterised in that said skirt (31) of the drainage body (3) has at least one notch (47) adapted to allow the placing of a drainage syringe (64).
- 11. Device according to any one of Claims 1 to 10, characterised in that said drainage body (3) has an output aperture (38) in the continuation of the internal passage of a coaxially disposed output pipe (37).
  - 12. Device according to Claim 11, characterised in that said drainage body (3) has, around said output pipe (37), an annular rib (40) tapering towards its end.
- 13. Method for draining a device according to Claim 12, characterised in that it is placed on a vacuum flask (71) with said output pipe (37) engaged in the central hole (75) of the stopper (74) of said flask and said annular rib (40) resting on this stopper.









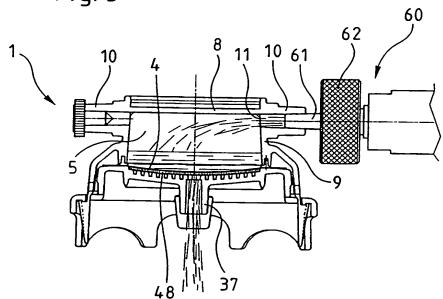
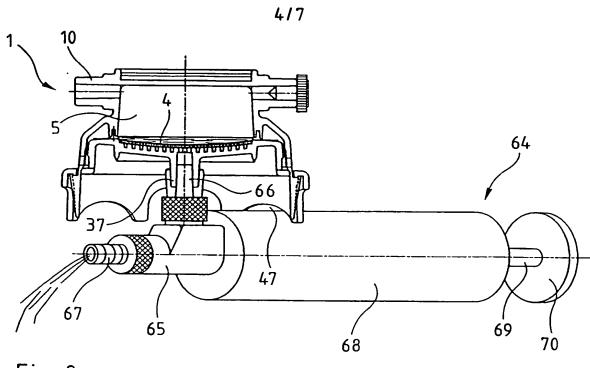
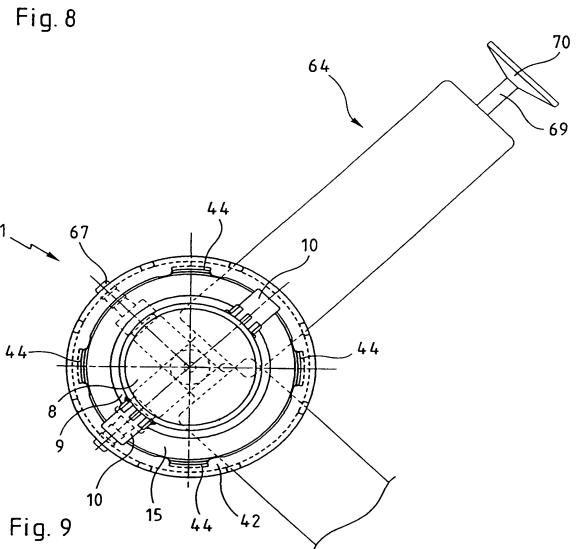


Fig. 7

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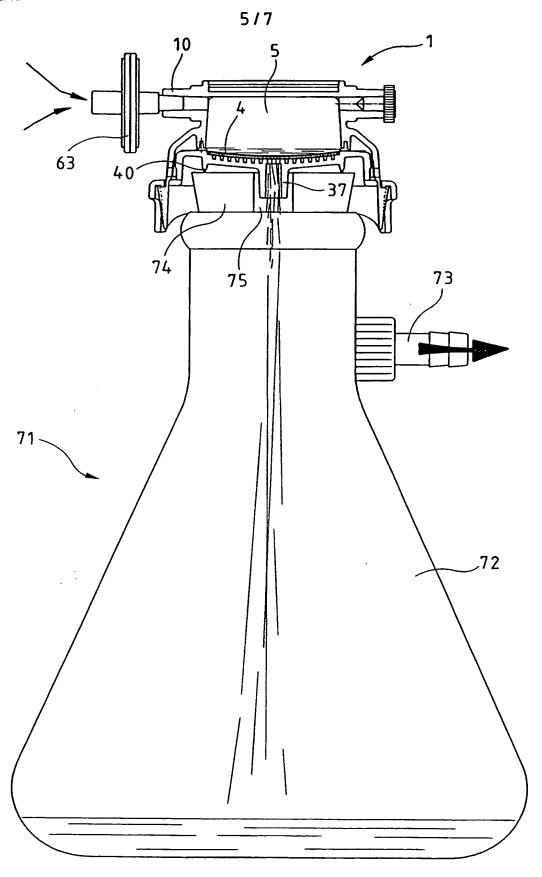


Fig. 10

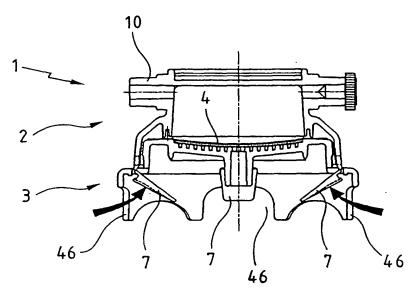


Fig. 11

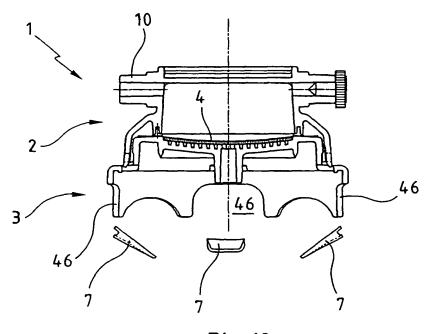
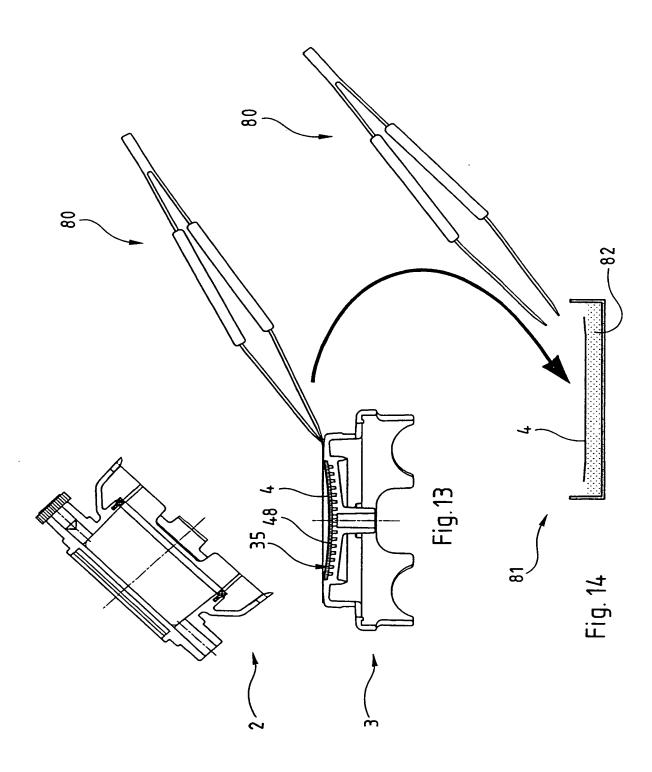


Fig. 12



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tr. Ional Application No PCT/IB 00/01908

A. CLASSI IPC 7	FICATION OF SUBJECT MATTER C12M1/12			
According to	o International Patent Classification (IPC) or to both national classific	ication and IPC		
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Minimum do IPC 7	ocumentation searched (classification system followed by classificat C12M B01D B01L	lion symbols)		
	tion searched other than minimum documentation to the extent that			
	lata base consulted during the international search (name of data be ternal, WPI Data, PAJ	ase and, where practical, search terms used	)	
C. DOCUM	ENTS CONSIDERED TO BE RELEVANT			
Category °	Citation of document, with indication, where appropriate, of the re	elevant passages	Relevant to claim No.	
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Furt	ther documents are listed in the continuation of box C.	X Patent family members are listed	in annex.	
'A' docume consid 'E' earlier of filing of 'L' docume	ent which may throw doubts on priority claim(s) or	<ul> <li>*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</li> <li>*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</li> </ul>		
which citation of documents of the citation of citation of the citation of the citation of citation of citatio	is cited to establish the publication date of another n or other special reason (as specified) ent referning to an oral disclosure, use, exhibition or means ent published prior to the international filing date but han the priority date claimed	"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family		
	actual completion of the international search	Date of mailing of the international sea		
1	9 February 2001	23/02/2001		
Name and r	mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk	Authorized officer		
	Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Coucke, A		

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